Traffic Engineering 101 - The Basics

Understanding the basic principles and how these drive the decisions regarding traffic management in Louisiana

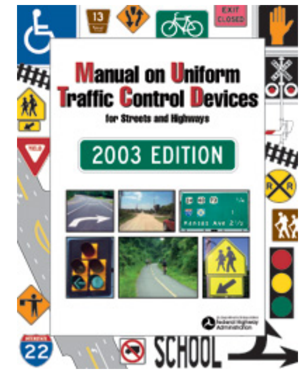
Traffic Engineering 101

- Purpose:
  - To provide an overview of engineering principles; guidelines & laws which govern traffic management in Louisiana
  - Discuss how DOTD's decisions impact local communities
  - Facilitate feedback & questions from local agencies on state and local traffic engineering issues

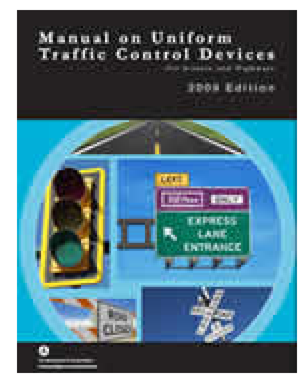
Make the Most of These Webinars

- Pick topics of interest & notify others
- Invite community to participate
    - Elected officials
    - Planners & engineers
    - Law enforcement
    - Road managers
    - Economic development
- Provide feedback & ask questions

Manual on Uniform Traffic Control Devices

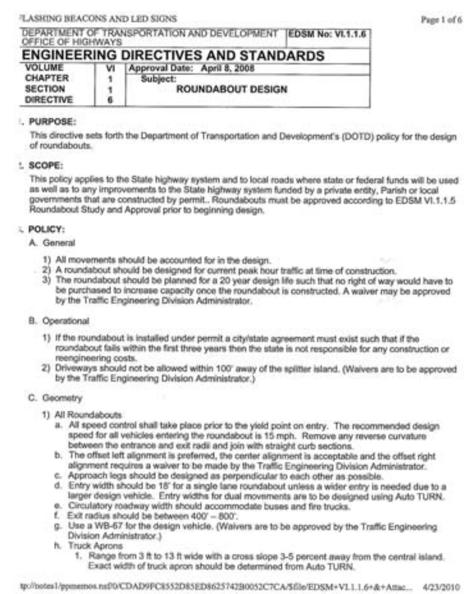


- Federal policy
- All states must adopt
- Set minimums for traffic control devices such as
  - Signs
  - Pavement marking
  - And signals



Engineering Directive and Standard Manual (EDSM)

- DOTD policy
- Signed by Chief Engineer
- Provides additional requirements



'LASHING BEACONS AND LED SIGNS — Page 1 of 6

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT OFFICE OF HIGHWAYS	EDSM No: VI.1.1.6

ENGINEERING DIRECTIVES AND STANDARDS

VOLUME	VI	Approval Date: April 8, 2008
CHAPTER	1	Subject:
SECTION	1	ROUNDABOUT DESIGN
DIRECTIVE	6	

PURPOSE:

This directive sets forth the Department of Transportation and Development's (DOTD) policy for the design of roundabouts.

SCOPE:

This policy applies to the State highway system and to local roads where state or federal funds will be used as well as to any improvements to the State highway system funded by a private entity, Parish or local governments that are constructed by permit.. Roundabouts must be approved according to EDSM VI.1.1.5 Roundabout Study and Approval prior to beginning design.

POLICY:

A. General

1) All movements should be accounted for in the design.
2) A roundabout should be designed for current peak hour traffic at time of construction.
3) The roundabout should be planned for a 20 year design life such that no right of way would have to be purchased to increase capacity once the roundabout is constructed. A waiver may be approved by the Traffic Engineering Division Administrator.

B. Operational

1) If the roundabout is installed under permit a city/state agreement must exist such that if the roundabout fails within the first three years then the state is not responsible for any construction or reengineering costs.
2) Driveways should not be allowed within 100' away of the splitter island. (Waivers are to be approved by the Traffic Engineering Division Administrator.)

C. Geometry

1) All Roundabouts
   a. All speed control shall take place prior to the yield point on entry. The recommended design speed for all vehicles entering the roundabout is 15 mph. Remove any reverse curvature between the entrance and exit radii and join with straight curb sections.
   b. The offset left alignment is preferred, the center alignment is acceptable and the offset right alignment requires a waiver to be made by the Traffic Engineering Division Administrator.
   c. Approach legs should be designed as perpendicular to each other as possible.
   d. Entry width should be 18' for a single lane roundabout unless a wider entry is needed due to a larger design vehicle. Entry widths for dual movements are to be designed using Auto TURN.
   e. Circulatory roadway width should accommodate buses and fire trucks.
   f. Exit radius should be between 400' – 800'.
   g. Use a WB-67 for the design vehicle. (Waivers are to be approved by the Traffic Engineering Division Administrator.)
   h. Truck Aprons
      1. Range from 3 ft to 13 ft wide with a cross slope 3-5 percent away from the central island. Exact width of truck apron should be determined from Auto TURN.

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Basic Principle of Traffic Engineering

"Everything is designed to meet Driver Expectancy"

TR Engineering 101

- Module:
  1. Introduction & Overview (3/22/10)
  2. **Speed Management Overview (4/26/10)**
  3. **School Zones (4/26/10)**
  4. Intersection Traffic Control (5/24/10)
  5. Traffic Signal (5/24/10)
  6. Roundabouts (5/24/10)
  7. Sign Selection & Installation (6/28/10)
  8. Work Zones (6/28/10)
  9. Access Management (7/26/10)

Speed Limits

- Theory of speed limits
- State Laws
- DOTD’s policy on speed limits
- How to do a speed study
- What signs do we use?

Terrebonne Speed Study

- The Federally funded project was conducted in 2004 and 2005

- Included a review of speed limits from the engineering and enforcement perspectives

- Discussion of results brought to light by study

Enforcement of Speeds

- Discuss LSP organization
- How the State Police Enforce Speed Limits
- Aggressive Driving Task Force

School Zones

- When to set a school speed zone
- DOTD’s policy
- MUTCD guidance
- How to sign
- Flashing school sign

Safe Routes to School

- What is this program?
- How can you get involved?

Safe Routes to School program - Walk to School Day

Intersection Traffic Control & Management

- Different intersection types
- Control options
  - Stop control
  - Traffic signals
  - Roundabouts
  - Innovative designs
- Evaluation & selection of control device/method

Suggestions & Feedback

- Specific questions you have regarding the major topics:
  - DOTD’s traffic engineering staff & general program
  - Speed management decisions
  - Intersections
  - Traffic signals
  - Roundabouts
  - Signs
  - Access management

More Suggestions?

Other traffic issues or questions?

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or:

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SPEED LIMITS

How do we control driving speeds?

- By setting reasonable speed limits.

Speed Limits

- What does state law require?
- State Highways/Local Roads?
- What is a reasonable and safe speed limit?
- Who sets speed limits?
- How they are set?
- Speed limit signing?

What does State law say?

- Louisiana Revised Statute 32:61
  - Sets statutory Speed Limits for “any highway of this state”
  - 55 mph max speed on all roads, except:
    - 70 mph on Interstate
    - 65 mph on divided highways

State Highway Speed Zones

RS 32:61

- DOTD to develop criteria to set lower speed limits

RS 32:63

- Lower speed limits must be based on an engineering study
- Limits become effective upon posting

Local Roads Speed Zones

RS 32:41

- Local municipal authorities may adopt ordinances establishing speed limits

RS 33:1236

- Parishes may adopt ordinances establishing speed limits

State and Local Roads

RS 32:235

- DOTD shall adopt a manual and specifications for a uniform system of traffic control devices for use upon highways within this state
- Traffic control devices erected by local municipal and parish authorities shall conform to the department's manual

What are reasonable and safe speed limits?

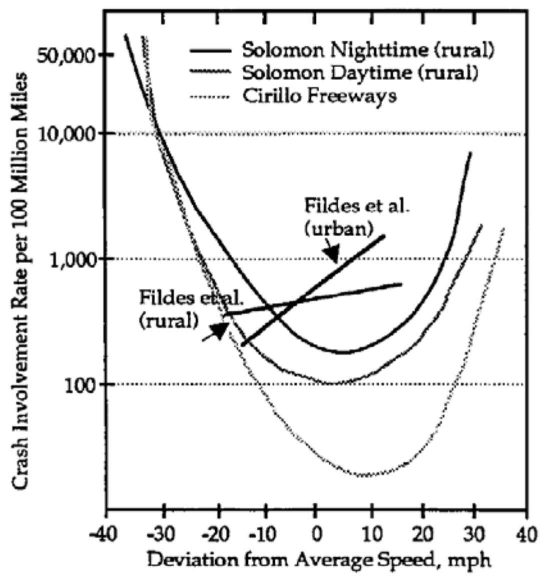
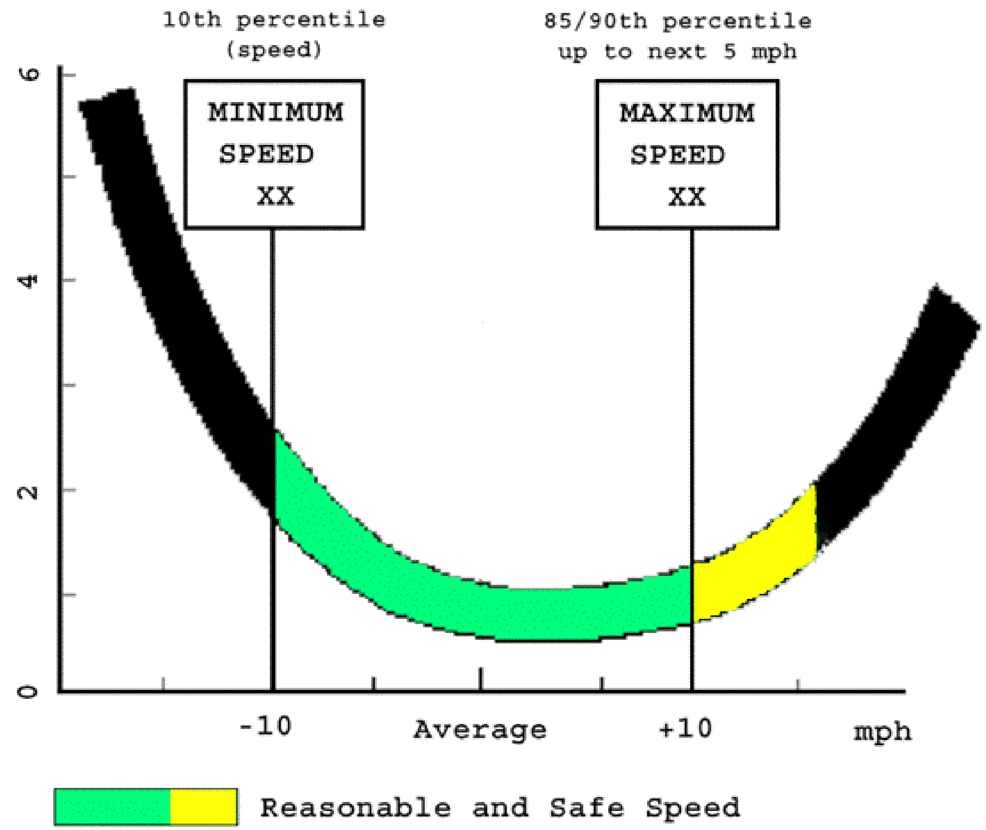


Figure 2-1 Vehicle crash involvement rates as a function of deviation from average traffic speeds (Solomon 1964; Cirillo 1968; Fildes et al. 1991 in Stuster and Coffman 1997, 6). 1 mph = 1.609 km/h.



FHWA Synthesis of Speed Zoning Practice Report FHWA/RD-85/096

The safest speed is:

- Not necessarily the lowest speed.
- Its when everyone drives the same speed
  - Few vehicles pass and are passed.
  - Less tailgating and congestion
- The best speed limit is one which most people will follow.
- This requires measuring existing speeds.

Statistics of Speeds

What is the 85th Percentile & why is it important?

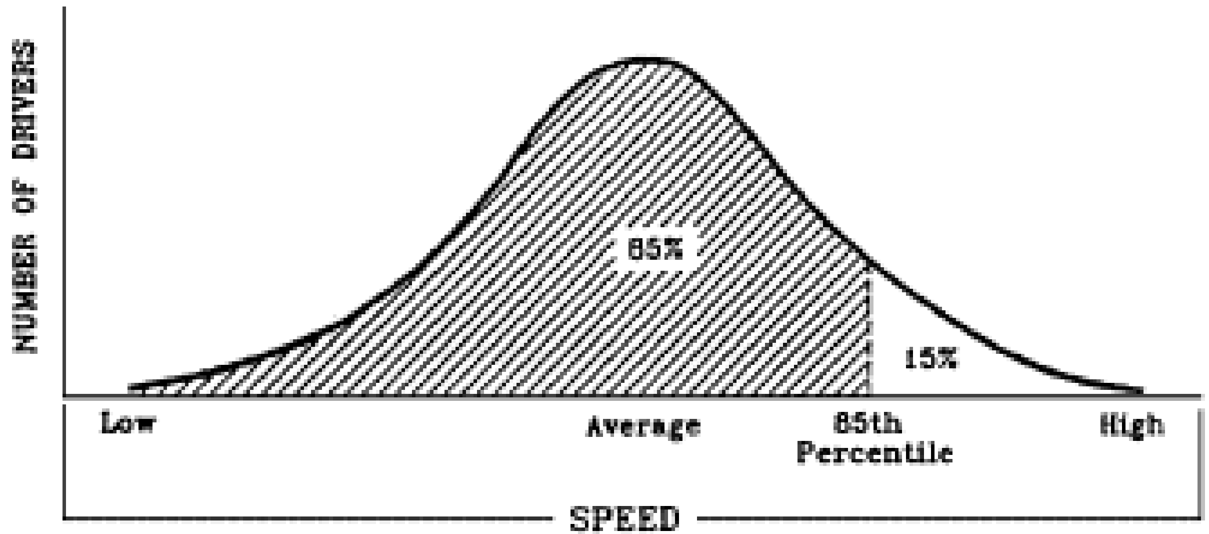
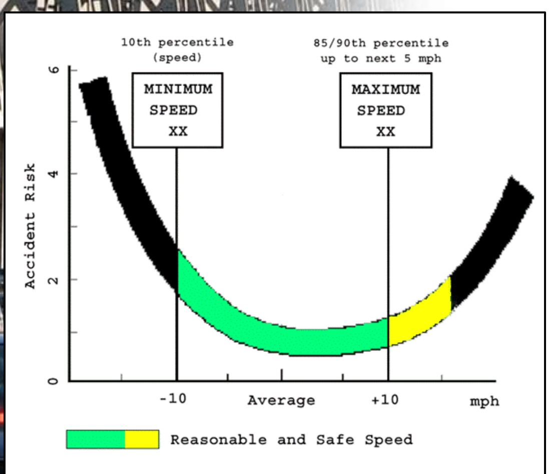


Figure 3-2 Speed distribution showing the 85th percentile speed (Krammes et al. 1996).

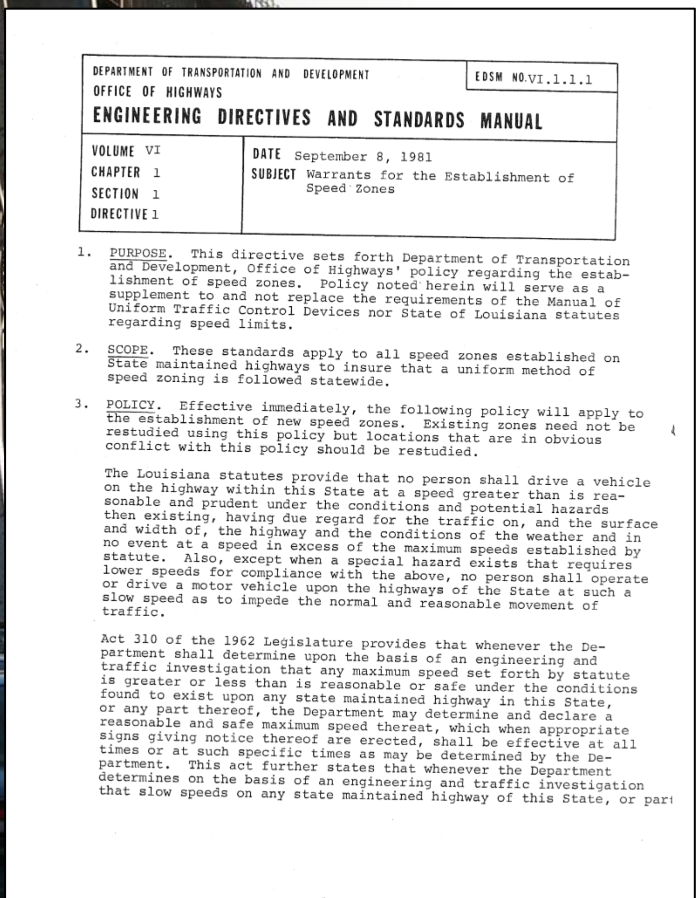
85th Percentile Speed

- Advantages of setting the speed limit at the 85th
  - Police are enabled to focus their enforcement efforts on the most dangerous speed outliers
  - Crash involvements are lowest near the 85th



DOTD's Speed Limit Policy

- Engineering Directives and Standards Manual (EDSM) VI.1.1.1
- States criteria for developing lower speed limits
- Requires an engineering study commonly known as a Speed Study.



DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT OFFICE OF HIGHWAYS ENGINEERING DIRECTIVES AND STANDARDS MANUAL	EDSM NO. VI.1.1.1
VOLUME VI CHAPTER 1 SECTION 1 DIRECTIVE 1	DATE September 8, 1981 SUBJECT Warrants for the Establishment of Speed Zones

1. PURPOSE. This directive sets forth Department of Transportation and Development, Office of Highways' policy regarding the establishment of speed zones. Policy noted herein will serve as a supplement to and not replace the requirements of the Manual of Uniform Traffic Control Devices nor State of Louisiana statutes regarding speed limits.

2. SCOPE. These standards apply to all speed zones established on State maintained highways to insure that a uniform method of speed zoning is followed statewide.

3. POLICY. Effective immediately, the following policy will apply to the establishment of new speed zones. Existing zones need not be restudied using this policy but locations that are in obvious conflict with this policy should be restudied.

   The Louisiana statutes provide that no person shall drive a vehicle on the highway within this State at a speed greater than is reasonable and prudent under the conditions and potential hazards then existing, having due regard for the traffic on, and the surface and width of, the highway and the conditions of the weather and in no event at a speed in excess of the maximum speeds established by statute. Also, except when a special hazard exists that requires lower speeds for compliance with the above, no person shall operate or drive a motor vehicle upon the highways of the State at such a slow speed as to impede the normal and reasonable movement of traffic.

   Act 310 of the 1962 Legislature provides that whenever the Department shall determine upon the basis of an engineering and traffic investigation that any maximum speed set forth by statute is greater or less than is reasonable or safe under the conditions found to exist upon any state maintained highway in this State, or any part thereof, the Department may determine and declare a reasonable and safe maximum speed thereat, which when appropriate signs giving notice thereof are erected, shall be effective at all times or at such specific times as may be determined by the Department. This act further states that whenever the Department determines on the basis of an engineering and traffic investigation that slow speeds on any state maintained highway of this State, or part

What is a Speed Study?

- Measure free flow speeds
  - Determine speed statistics
- Inventory roadway
- Recommends speed
- Recommends length

How to measure free-flow speeds?

- Equipment:
  - Stopwatch
  - Radar/Laser
  - Loops/tubes/video
- 100 vehicles or 1 hour max

Statistics of Speeds

MOTOR VEHICLE SPEED STUDY

Date 7-29-81 Location La. 964 STA. 1 Direction NORTH & SOUTH

Time 8:15-8:45AM Weather clear Road Surface Condition good

Sec.	MPH for 88'	AUTOMOBILES	LIGHT COMMERCIAL	HEAVY COMMERCIAL	BUSSES	CUM. TOTAL	CUM. %
0.8	75.0						
0.9	66.5						
1.0	60.0						
1.1	54.5	𝍷𝍷					
1.2	50.0	𝍸 - 𝍸 - 𝍷𝍷𝍷					100
1.3	46.0	𝍸 - 𝍸 - 𝍸 - 𝍷𝍷	𝍷𝍷𝍷	𝍷			98
1.4	42.9	𝍸 - 𝍸 - 𝍷	𝍸 -				85
1.5	40.0	𝍸 - 𝍷𝍷𝍷𝍷	𝍷𝍷	𝍷			64
1.6	37.8	𝍸 - 𝍷𝍷𝍷	𝍸 -	𝍷			48
1.7	35.0	𝍷𝍷𝍷𝍷	𝍷𝍷𝍷				36
1.8	33.3	𝍸 - 𝍷𝍷𝍷					22
1.9	31.4	𝍷𝍷𝍷𝍷					15
2.0	30.0	𝍷𝍷𝍷					7
2.1	28.5						3
2.2	27.3						
2.3	26.0						
2.4	25.0						
2.5	23.8						
2.6	23.1						
2.7	22.1						
2.8	21.4						
2.9	20.7						
3.0	20.0						
3.1	19.3						
3.2	18.8						
3.3	18.2						
3.4	17.6						
3.5	17.1						
3.6	16.7						
3.7	16.1						
3.8	15.8						
3.9	15.3						
4.0	15.0						
Totals							

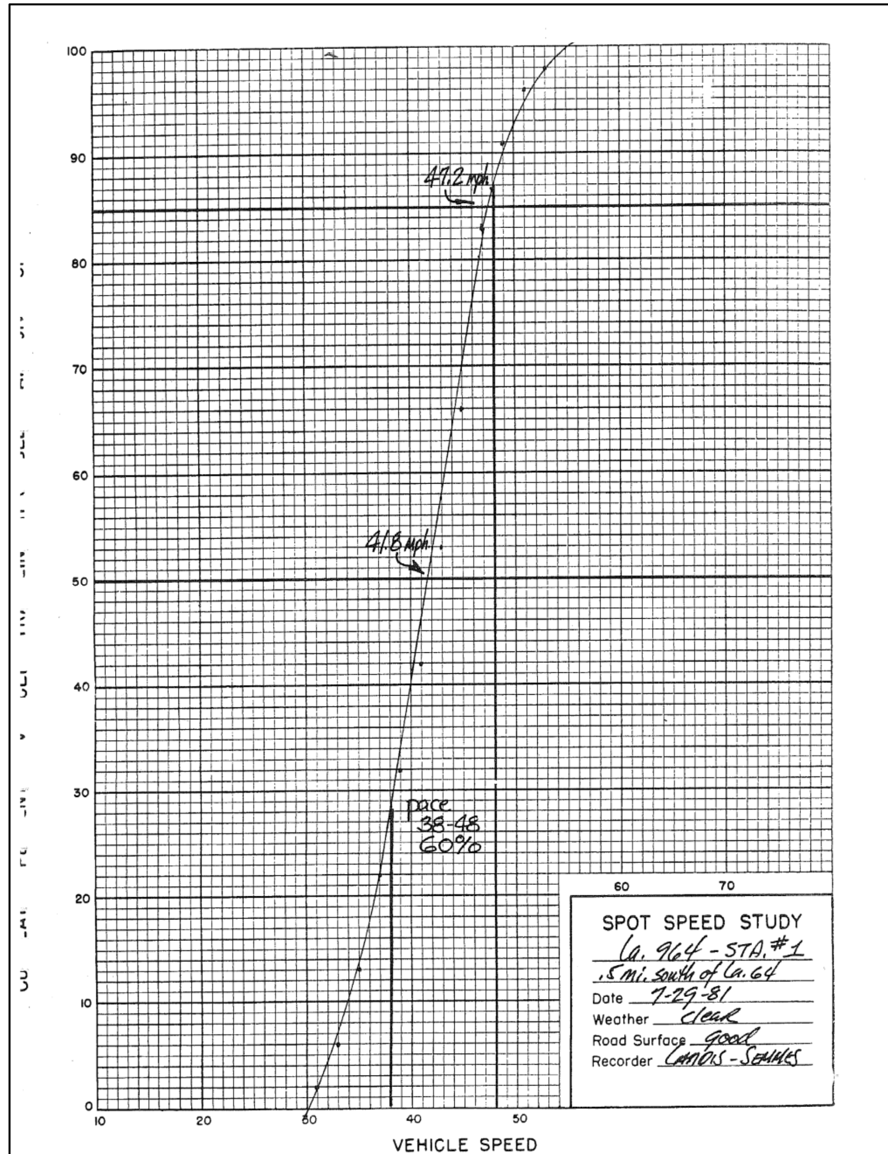
85% Speed 47.2

50% Speed 41.8

Mode STOPWATCH

Av. Speed

LANDIS - SEMMES



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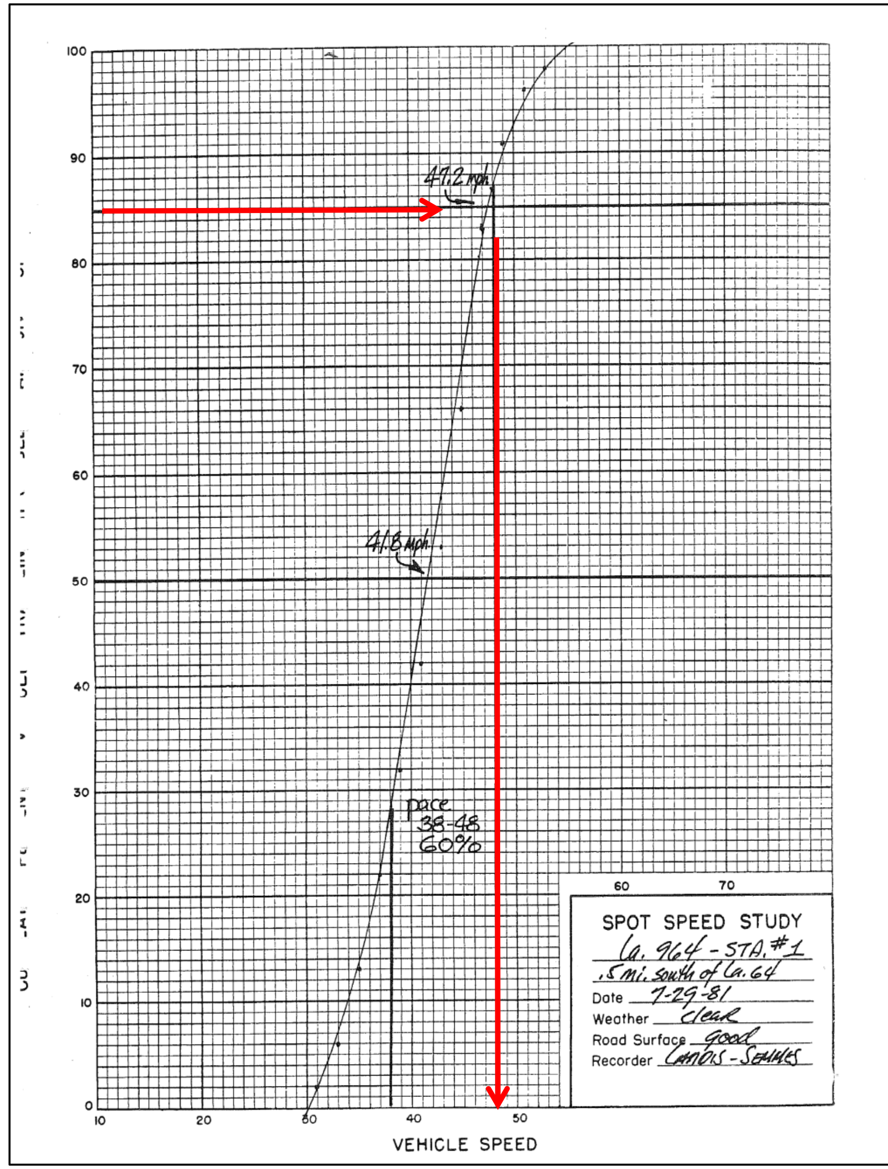
0.9	66.5						
1.0	60.0						
1.1	54.5	II					
1.2	50.0	~~IIII~~ - ~~IIII~~ - III					100
1.3	46.0	~~IIII~~ - ~~IIII~~ - ~~IIII~~ - II	III	I			98
1.4	42.9	~~IIII~~ - ~~IIII~~ - I	~~IIII~~ -				85
1.5	40.0	~~IIII~~ - IIII	II	I			64
1.6	37.8	~~IIII~~ - III	~~IIII~~ -	I			48
1.7	35.0	IIII	III				36
1.8	33.3	~~IIII~~ - III					22
1.9	31.4	IIII					15
2.0	30.0	III					7
2.1	28.5						3
2.2	27.3						
2.3	26.0						
2.4	25.0						
2.5	23.8						
2.6	23.1						
2.7	22.1						
2.8	21.4						
2.9	20.7						
3.0	20.0						
3.1	19.3						
3.2	18.8						
3.3	18.2						
3.4	17.6						
3.5	17.1						
3.6	16.7						
3.7	16.1						
3.8	15.8						
3.9	15.3						
4.0	15.0						
Totals							

Existing speed limit : 45 mph

85% Speed 47.2 Mode STOPWATCH

50% Speed 41.8 Av. Speed

LANDIS - SEMMES



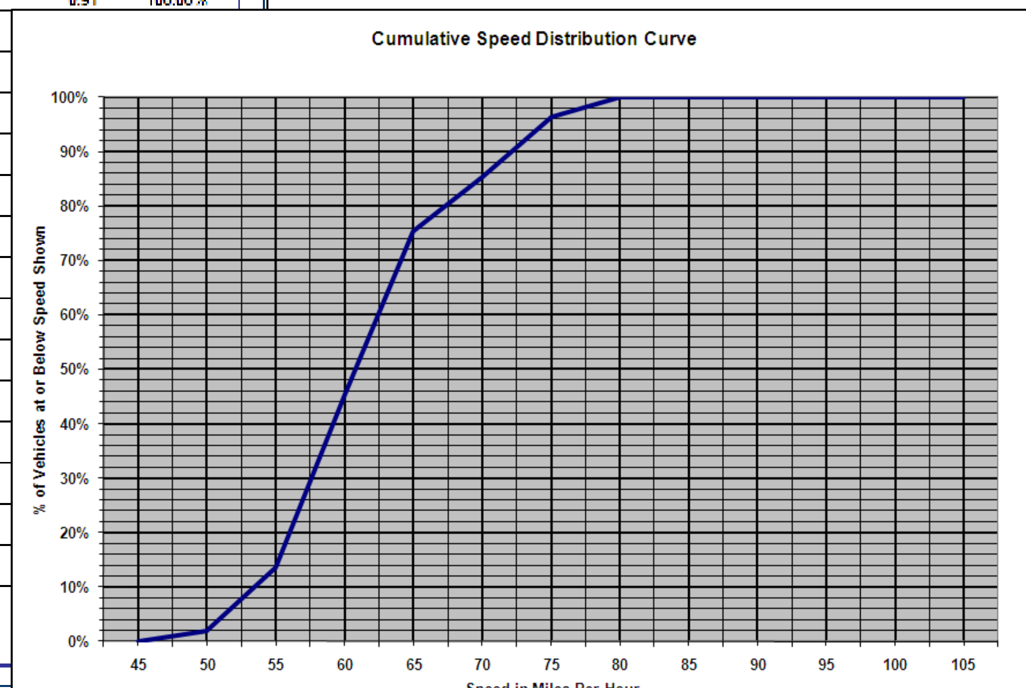
Statistics of Speeds

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
DISTRICT 61 TRAFFIC SECTION
SPOT SPEED STUDY

LOCATION :	LA 641 ~ 1.8 MILES SOUTH OF I - 10 EAST BOUND OFF RAMP		
REPORT #		TIME OF STUDY	10:54 - 11:33 am
DATE:	05/02/06	WEATHER:	CLOUDY & WARM
DIRECTION OF TRAVEL	NORTH & SOUTHBOUND	ROAD CONDITIONS	GOOD
ROUTE:	LA 641	PARISH:	ST. JAMES
CONTROL SECTION	847 - 02	POSTED SPEED LIMIT	55

MEAN (AVERAGE)	62.1	15 TH PERCENTILE	56
MODE:	62	85 TH PERCENTILE:	70
MEDIAN	62	95 TH PERCENTILE	75
BOTTOM OF 10 MPH PACE SPEED:	56	NO. OF OBSERVATIONS:	110
TOP OF 10 MPH PACE SPEED	65	% OF VEHICLES IN PACE RANGE	61.8%

SPEED	FREQ.	Percent	Cumlative Percent	SPEED	FREQ.	Percent	Cumlative Percent
40				74			
41				75	3	2.73	96.36%
42				76	1	0.91	97.27%
43				77			
44				78	2	1.82	99.09%
45				79	1	0.91	100.00%
46	1	0.91	0.91%	80			
47				81			
48				82			
49				83			
50	1	0.91	1.82%	84			
51	2	1.82	3.64%	85			
52				86			
53	6	5.45	9.09%	87			
54	1	0.91	10.00%	88			
55	4	3.64	13.64%	89			
56	5	4.55	18.18%	90			
57	7	6.36	24.55%	91			
58	7	6.36	30.91%	92			
59	7	6.36	37.27%	93			
60	9	8.18	45.45%	94			
61	5	4.55	50.00%	95			
62	11	10.00	60.00%	96			
63	4	3.64	63.64%	97			
64	7	6.36	70.00%	98			
65	6	5.45	75.45%	99			
66	3	2.73	78.18%	100			
67	2	1.82	80.00%	101			
68	3	2.73	82.73%	102			
69				103			
70	3	2.73	85.45%	104			
71	4	3.64	89.09%	105			
72	3	2.73	91.82%				
73	2	1.82	93.64%				



Statistics of Speeds

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DISTRICT 61 TRAFFIC SECTION
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TOP OF 10 MPH PACE SPEED	65	% OF VEHICLES IN PACE RANGE	61.8%

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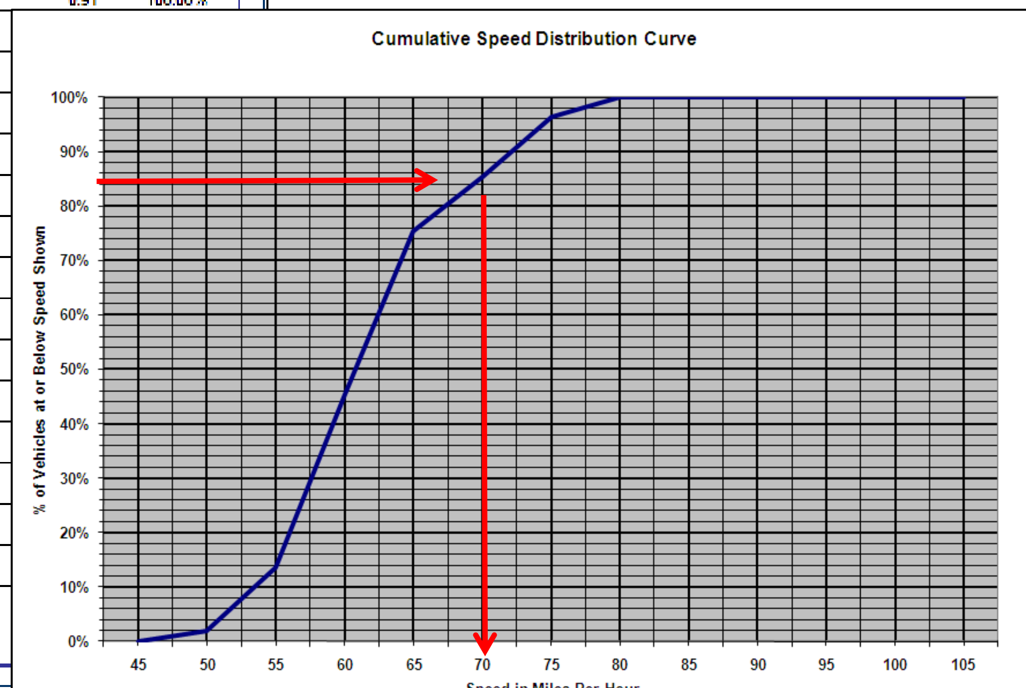
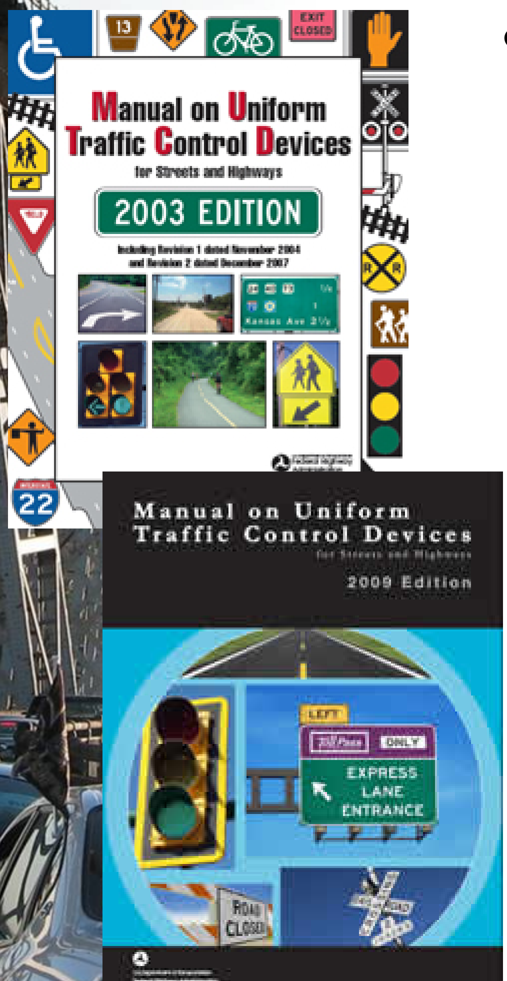
40				74			
41				75	3	2.73	96.36%
42				76	1	0.91	97.27%
43				77			
44				78	2	1.82	99.09%
45				79	1	0.91	100.00%
46	1	0.91	0.91%	80			
47				81			
48				82			
49				83			
50	1	0.91	1.82%	84			
51	2	1.82	3.64%	85			
52				86			
53	6	5.45	9.09%	87			
54	1	0.91	10.00%	88			
55	4	3.64	13.64%	89			
56	5	4.55	18.18%	90			
57	7	6.36	24.55%	91			
58	7	6.36	30.91%	92			
59	7	6.36	37.27%	93			
60	9	8.18	45.45%	94			
61	5	4.55	50.00%	95			
62	11	10.00	60.00%	96			
63	4	3.64	63.64%	97			
64	7	6.36	70.00%	98			
65	6	5.45	75.45%	99			
66	3	2.73	78.18%	100			
67	2	1.82	80.00%	101			
68	3	2.73	82.73%	102			
69				103			
70	3	2.73	85.45%	104			
71	4	3.64	89.09%	105			
72	3	2.73	91.82%				
73	2	1.82	93.64%				



Inventory Roadway

- Type of roadway
- Geometric features
- Spacing of intersections/driveways
- Sight distance
- Horizontal/vertical alignment
- Crash data
- On street parking/Pedestrians

Determine 85th



- Manual on Uniform Traffic Control Devices (MUTCD)

"When a speed limit within a speed zone is posted, it should be within 5 mph of the 85th% of free-flowing traffic."

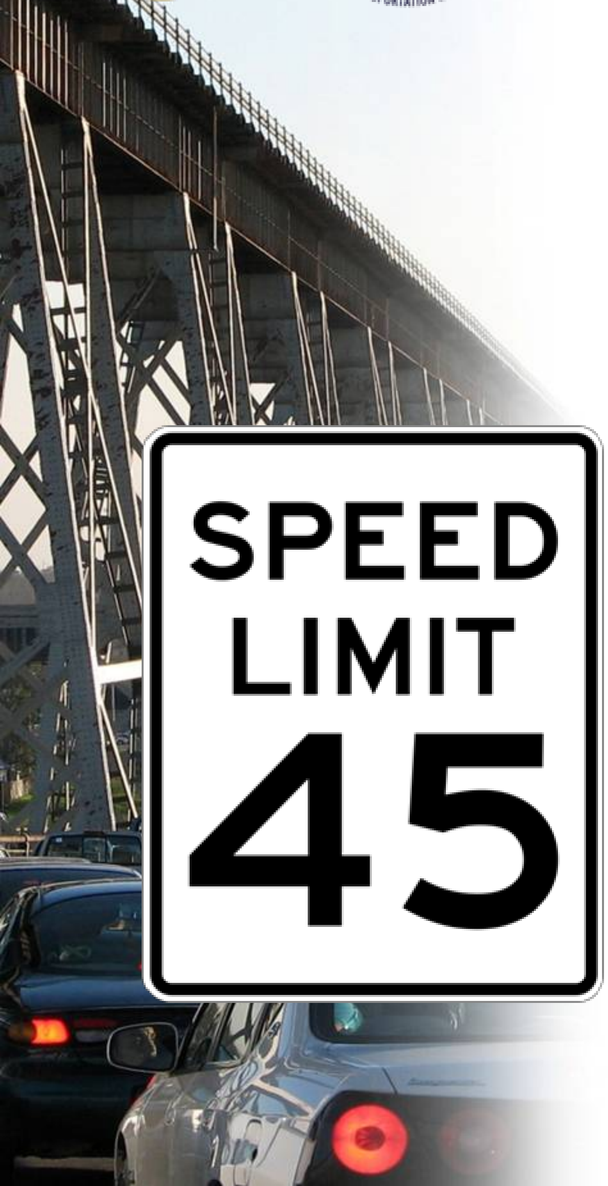
When not to use the 85th

- Above the statutory
- Road inventory issues
  - Features
  - Geometry
  - Crashes
  - Parking/pedestrians
- Schools

Chief Engineers Order

- Engineering report that states speed limit and the length of the zone
- Signed & Stamped by a licensed Professional Engineer
- Approval of Chief Engineer
- Filed in the local courthouse
- Signs are installed

Where Do You Place Signs?

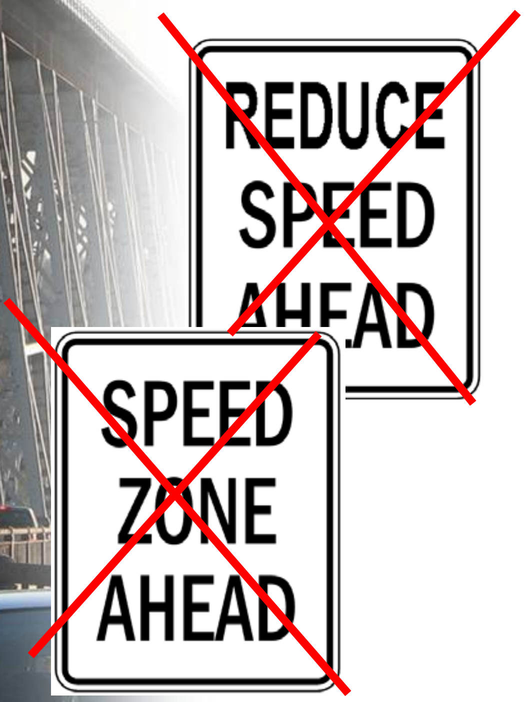


MUTCD requirements

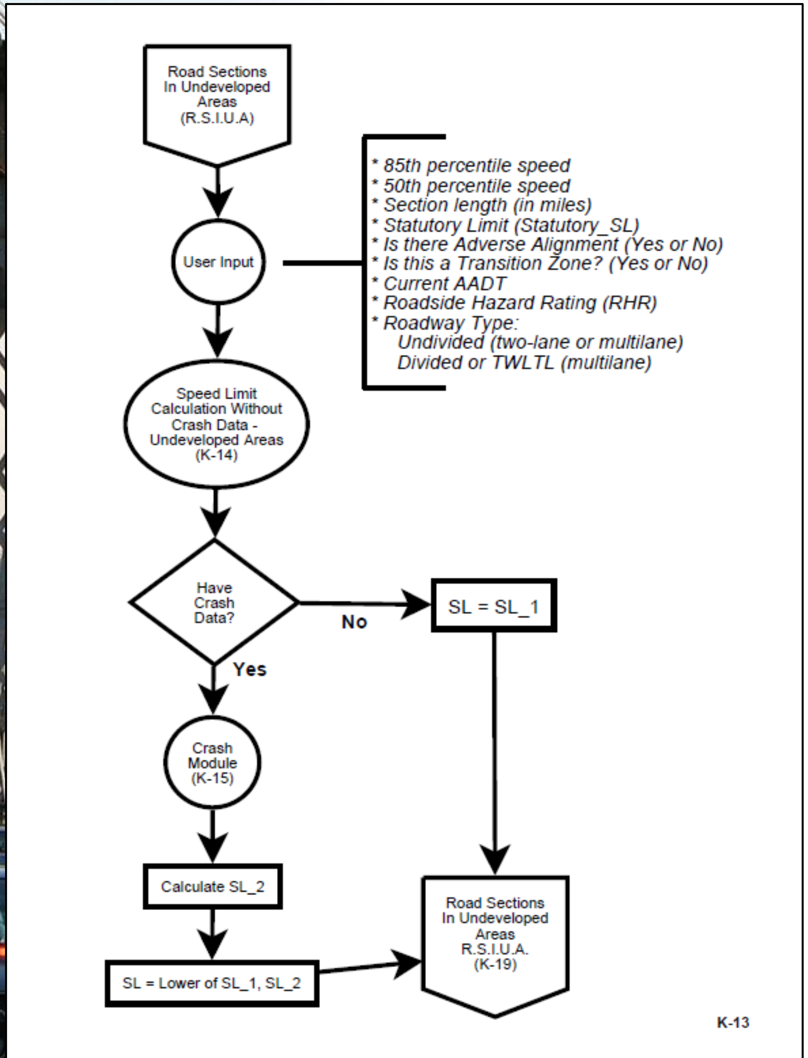
- Where speed limits change
- Beyond major intersections
- Where necessary to remind road users

Warning Signs

- Place prior to each speed zone



Future Tools



US LIMITS

- A web based expert system for recommending speed limits in speed zones.
- uslimits.com

Radar speed displays

Questions?

Contact Information:

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peter.allain@la.gov

References:

www.legis.state.la.us

www.mutcd.fhwa.dot.gov

www.dotd.la.gov/highways/traffic/home.aspx

Terrebonne Parish Consolidated Government

Department of Public Safety

Ralph D. Mitchell Jr. - Director

Department of Public Safety

Terrebonne Parish Consolidated Government

“Rational Speed Limits”

Department of Public Safety

Terrebonne Parish Consolidated Government

Problem Statement

Engineering

Louisiana Safe Routes to School Program

- 4rd application cycle opened 1/4/10

- 50 projects approved for funding between 2007 and 2010

- 3 statewide conferences

Safe Routes to School program - Walk to School Day

Preparing To Apply

- Don’t Wait – Start Now
- Form A Team
- Collect Information
- Identify Problems
- Identify Solutions

Project Funding

- Reimbursable Program – Not A Grant
  - Sponsor pays and is reimbursed
- Federal Share Is 100%
  - No match is required
  - Use of other sources encouraged
- Some Activities Will Not Be Funded
  - Right of Way
  - Utility Relocations

Project Funding (Cont.)

- Maximum of $250,000 for infrastructure
- Maximum of $50,000 for non-infrastructure
- Maximum of $150,00 for large scale Non-infrastructure only projects

Inappropriate Use Of Funds

- Projects that do not specifically serve the stated purpose of the SRTS program
- Funds for reoccurring costs
- Projects solely to accommodate drivers or bus transportation
- Projects not within 2 miles of elementary or middle school

Project Selection

- Initial Review
  - Check Required Information
- Committee Review
  - Score Applications
  - Rank Application
- Select Projects To Be Funded
- Sponsor Notified

For more information…

Louisiana Safe Routes to School

www.dotd.louisiana.gov/planning/highwaysafety/saferout

National Center for Safe Routes to School

www.saferoutesinfo.org

US DOT Federal Highway Administration

http://safety.fhwa.dot.gov/saferoutes/

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Traffic Engineering 101

- Thank You!

- See you on May 24th at 2:00PM for Intersection Control and Management---All way stop, Traffic Signals, Roundabouts