Traffic Engineering 101 - The Basics

Understanding the basic principles and how these drive the decisions regarding traffic management in Louisiana
Traffic Engineering 101
March 22, 2010

• 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 Design Standard Manual

- DOTD policy
- Signed by Chief Engineer
- Provides additional requirements
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)
Introduction to Traffic Management in LA

- Overview of LA’s transportation system
- Funding programs
- DOTD policies
- National guidelines
- MUTCD
- Louisiana laws
- DOTD’s Traffic Engineering organization
Road Safety Management

- LA SHSP
- HSIP
- LRSP
- Rail grade crossing safety
Determination of Speed Limits

- Purpose of speed limits
- Safety issues w/ speed limits
- DOTD’s policy on speed limits
- How to do a speed study
- Enforcement of speeds
School Zones

• When to set a school speed zone
• DOTD’s policy
• How to sign
• Flashing school sign
Intersection Traffic Control & Management

• Different intersection types

• Control options
  – Stop control
  – Traffic signals
  – Roundabouts
  – Innovative designs

• Evaluation & selection of control device/method
Intersection Questions & Considerations

• How many people?
  – Turning left
  – Turning right
  – Going thru

• What are the busy times?

• Are there turn lanes?

• How will this affect the entire street?
Traffic Signals

- When are they warranted
- How are warrants determined?
- DOTD’s process to install or upgrade
- Cost for installation/upgrade
- Cost & methods to maintain
- DOTD’s Signal design manual
- DOTD signal EDSM’s
- MUTCD guidance
Roundabouts

• What are they?
• Where should they be installed?
• DOTD’s policy
• Cost of installation & maintenance
• How do they improve traffic?
Effective Sign Selection & Installation

• DOTD’s policy on signs
  – Interstate & non-Interstate

• MUTCD on signs
  – Standard vs. special

• Permitted signs
  – Gateway
  – Regulatory (engine brake, Do Not Litter)
  – Warning (school signs, plant entrance)
Work Zones

- Policies
- Traffic control details
- MUTCD
Access Management In Louisiana

- What is it & why do we need it?
- What is in place now?
- What is planned?
- EDSMs
- New access rule, handbook
- How can we work together to achieve this?
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?

• Contact Jody Colvin at Jody.Colvin@la.gov

• or Marie B. Walsh at mbwalsh@ltrc.lsu.edu
Overview of the DOTD Highway Project Selection Process
“In fixing priorities, the department shall consider primarily the condition of roads, streets, and structures making up the state highway system.....”

RS 48:229
Overview of the DOTD

Highway Project Selection Process

What are the goals for the State Highway System?

1. Preserve (i.e., maintain) the system
2. Operate the system
3. Improve the safety of the system
4. Expand the system
Overview of the DOTD

Highway Project Selection Process

What are the categories of highway projects?

1. System Preservation
2. Operations/Motorist Services
3. Traffic Safety
4. Additional Capacity/New Infrastructure
Project Categories

System Preservation

- Non-interstate roadways
- Interstate roadways
- On-system bridges
- Off-system bridges
Project Categories

Operations

- ITS
- Traffic control devices
- Roadway flooding
- Weigh stations
- Rest areas
- Moveable bridge (elec./mech.)
- Interstate lighting
- Traffic system management
Project Categories

Safety

- Regular Safety Program
- Railroad Crossing Upgrades
- Safe Routes to School
- Local Road Safety Program
Project Categories

Other Programs

- Urban System
- Congestion Management/Air Quality
- Enhancement
TOTAL CONSTRUCTION BUDGET

SYSTEM PRESERVATION

ADDITIONAL CAPACITY/NEW INFRASTRUCTURE

TRAFFIC SAFETY

OPERATIONS/MOTORIST SERVICES
Construction Budget
FY 2010-2011

- Sys Preservation        $335 M
- Ops/Motor. Services     $ 47 M
- Safety                  $ 44 M
- Add. Capacity - Discretionary $ 11 M
  - Corridors            $ 0 M
  Sub-total              $437 M

- Urban Systems/Local Programs $ 89 M
- High Priority/Bond/Misc.  $ 33 M

Grand Total              $559 M
How are projects identified?

• Gather and analyze data
  - condition, operations, safety, and congestion

• Seek customer input (Legislative Hearings & year round)
  - Public
  - State and local elected officials
  - Metropolitan Planning Organizations
  - Rural Consultation Process
  - Regional/local planning officials
  - Other state agencies
  - Federal agencies
Overview of the DOTD Highway Project Selection Process

How are projects prioritized and selected?

- DOTD District and MPO officials rank projects based on:
  - Technical analyses
  - Customer input

- Project Selection Teams make the final selections based on:
  - District recommendations
  - Technical analyses
  - Customer input
  - Available funding
Overview of the DOTD Highway Project Selection Process

Then What Happens?
Overview of the DOTD

Highway Project Selection Process

Recommended (selected) projects assembled into proposed Highway Program

Proposed Highway Program submitted to House & Senate Transportation Committees

Joint Transportation Committee holds public hearings throughout state for the Program & STIP

Final decision on Highway Program rests with House & Senate Trans. Committees and ultimately full Legislature
Local Programs
What is an MPO?
MPO Projects

• For projects funded with the MPO’s Federal Urban Systems Funds (STP <200K, STP>200K), the MPO selects the projects
Other Local Programs
Local Programs

- Local Road Safety
- Safe Routes to School
- Off-System Bridge Program
- Enhancements
- Congestion Management/Air Quality
Off-System Bridge Program

- Participation
- Funding
- Program Cycle
- Requirements
Enhancement Program

- Facilities for pedestrians and bicycles
- Pedestrian and bicycle safety & educational activities
- Acquisition of scenic easements and scenic or historic sites
Congestion Management / Air Quality

- Participation
- Funding
- Program cycle
- Requirements
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DOTD’S TRAFFIC ENGINEERING ORGANIZATION
DOTD’s Districts

<table>
<thead>
<tr>
<th>Number</th>
<th>District Name</th>
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<tbody>
<tr>
<td>02</td>
<td>Bridge City</td>
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<tr>
<td>03</td>
<td>Lafayette</td>
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<tr>
<td>04</td>
<td>Bossier City</td>
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<tr>
<td>05</td>
<td>Monroe</td>
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<td>Lake Charles</td>
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<td>58</td>
<td>Chase</td>
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<tr>
<td>61</td>
<td>Baton Rouge</td>
</tr>
<tr>
<td>62</td>
<td>Hammond</td>
</tr>
</tbody>
</table>
LADOTD Organization Chart

• Traffic Engineering Management is under the Office of Engineering

• District Traffic Engineers are under Office of Operations
TEM Responsibilities

• Statewide
• Set policies for traffic engineering
• Review & design traffic plans
More TEM Responsibilities

- Design & update standard details & standard plans
- Update construction specifications
What Do the DTOE’s Do?

• “Operate” the roadway

• Determine improvements & upgrades to improve the safety & capacity of the roadway
DTOE’s Responsibilities

• Responsible for State Road System:
  – Signals
  – Striping
  – Signing
  – Work zone
  – Driveways
Policy – What Governs?

• Manual of Uniform Traffic Control Devices
  – Federal law
  – Current edition 2003, adopted in December 2005
  – Sets minimums for signs, pavement markings, & signals
  – In the process of reviewing the 2009 MUTCD for adoption
MUTCD Applies to:

• Public streets
• Highways
• Bikeways
• Private roads

* Parking lots are not included
MUTCD Levels of Requirements

• Standard - shall
• Guidance – should
• Option – may
• Support
MUTCD on the web…

mutcd.fhwa.dot.gov
Engineer Design Standard Manual (EDSM)

- Applicable to all state roads
- Applicable to any road financed (even partially) with federal funds
Examples of Traffic EDSMs:

- Warrant for establishment of Speed Zones
- Roundabout Safety and Approval
- Supplemental Guide Signs on Interstate Highways
- Horizontal Alignment Advisory Speed Signs
- Flashing Beacons and LED Flashing Signs
- Marking No Passing Zone for Special Situations
Policy – What Governs?

- EDSM’s
  - Policy signed by Chief Engineer
  - Defines Louisiana Standards
  - Must obtain a waiver or design exception from the Chief Engineer to go against an EDSM
Policy – What Governs?

• Policy Manuals
  
  – *Traffic Engineering Manual*: signed by Chief Engineer that defines TE policy
  
  – *Traffic Signal Design Manual*: defines design & study process for traffic signals
Policy – What Governs?

• Standard plans & details
  – Details
    • TS details
    • TTC details
    • Sign details
  – Standard Plans
    • HS-01 sign installation
    • PM-01 pavement marking
Policy – What Governs?

• Specifications
  – Describes type of materials to be used in construction & how contractor is to be paid
  – Special provisions
What Does This Mean?

- State routes are governed by
  - Federal policies (MUTCD)
  - State policies

- Local Roads (non-state) are governed by
  - MUTCD
Louisiana Strategic Highway Safety Plan (SHSP)

- Required by National SAFETEA-LU Legislation
- Requires Multi Disciplinary Approach
- Local Involvement Necessary
- LADOTD is lead agency
Four E’s of Safety

- Engineering
- Enforcement
- Education
- Emergency Services

Different Levels:

- Local
- State
- Federal
SHSP Stakeholders

- Highway Safety Commission
- Louisiana State Police Troop Commands
- Louisiana DOTD
- Local Technical Assistance Program
- Governor’s DUI Task Force
- EMS
- LSU Highway Safety Research Group
- Louisiana Municipal Association
- Supreme Court
- Office of Motor Vehicles
SHSP Stakeholders

- Association of Chiefs of Police
- District Attorneys Association
- Sheriff’s Association
- Operation Lifesaver
- Safe Routes to School
- Parish Engineers Association
- Motor Transport Association
- Federal representative
  - FHWA
  - FMCSA
  - NHTSA
  - Federal Railroad Administration
Vision and Mission

The **vision** of the Louisiana Strategic Highway Safety Plan (SHSP) is to reach *Destination Zero Deaths* on Louisiana roadways.

The **mission** of the SHSP is to *reduce the human and economic toll on Louisiana’s surface transportation system due to traffic crashes through widespread collaboration and an integrated 4E approach*. 
Goal: Reduce Fatalities 50% by 2030

- 2015: 845
- 2020: 724
- 2025: 603
- 2030: 483
2010 SHSP Emphasis Areas

- Alcohol Impaired Driving
- Occupant Protection
- Infrastructure and Operations
- Crashes Involving Young Drivers
Contributing Factors

- Unrestrained Passenger Fatalities (5+)
- Speed & Aggressive Driving Fatalities
- Alcohol-related Fatalities
- Run-off-road Fatalities
- Fatal Crashes Involving Young Drivers (15-24)
- Intersection Fatalities
- Large Truck Fatalities
- Pedestrian Fatalities
- Fatal Crashes Involving Older Drivers (65+)
- Motorcycle Fatalities
- Bicyclist Fatalities
- Railroad Fatalities
Occupant Protection

- Louisiana Seat Belt Use
- National Average - Seat Belt Use
- Primary Enforcement States - Seat Belt Use

- 2006: 75%
- 2007: 80%
- 2008: 85%

- 2006: 81%
- 2007: 83%
- 2008: 85%

- 2006: 75%
- 2007: 75%
- 2008: 75%
Roadway Departure

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent of All Fatal Crashes</th>
<th>Percent of All Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>43.1%</td>
<td>31.7%</td>
</tr>
<tr>
<td>2007</td>
<td>43.8%</td>
<td>32.5%</td>
</tr>
<tr>
<td>2008</td>
<td>44.1%</td>
<td>31.6%</td>
</tr>
</tbody>
</table>

- Blue: Percent of All Fatal Crashes Involving Roadway Departure
- Red: Percent of All Serious Injury Crashes Involving Roadway Departure
Intersections

Intersection fatal crashes as percent of all fatal crashes
Intersection serious injury crashes as percent of all serious injury crashes
Focus Area Action Plans

- DOTD Roadway Departure
- DOTD Intersection
- LTAP Local Road Safety Action Plan

Working with LHSC on:
- Occupant Protection
- Young Drivers
Task Forces

Subjects
- Speeding and Aggressive Driving
- Distracted and Inattentive Driving

Responsibilities
- Determine analysis methods
- Collaborate with the law enforcement community
- Identify effective countermeasures
Safety Accomplishments

- 8% decrease in crash-related fatalities from 2007 to 2008
- Safety training
- Median cable barrier
- Rural road safety improvement
- Low cost safety improvements in Pavement preservation projects
Safety Accomplishments

The Louisiana Local Road Safety Program (LRSP)

Legislative accomplishments

- Safety belt extended to all occupants
- Slow vehicles in the left lane
- Safety zone around bicyclists
- Penalties for driving under suspension
- License suspension administrative hearings
- Mandatory motorcycle helmet
Next Steps

- Select strategies

- Develop action plans
  - Emphasis area teams
  - Task forces
  - Regional safety action teams
Regional Safety Action Teams

- Local Leadership Needed
- Local participation & involvement necessary
- Proven in other states
- Contact DOTD Office of Highway Safety or Marie B. Walsh to get involved
Highway Safety Improvement Program (HSI P)
HSIP Components

Planning
- Problem Identification
- Countermeasure Identification
- Project Prioritization

HSIP Project List

STIP

Implementation
- Schedule and Implement Projects

Evaluation
- Determine Effects of Highway Safety Improvements

Data/Design Standards

Feedback
Typical Projects

- Intersection Improvements
- Striping
- Guard rail upgrade
- Cable barrier rail system
- Pavement markings
- Geometric improvements
Typical Improvements

- Minor widening
- Slope adjustments
- Signal upgrades
- Friction Treatments
Other Safety Programs

- Safe Routes to School (SRTS)
- High Risk Rural Road (HRRR)
- Bicycle/Pedestrian Safety
- Highway/Rail Grade Crossing Safety
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Highway/Rail Safety

• LADOTD’s Diagnostic Review Process

  – We need your input to:
    • Help determine TRUE existing conditions
    • Help determine appropriate plan of action

  – You know your community best
Highway/Rail Safety

Signs


Figure 8B-4. Warning Signs and Plaques for Grade Crossings

Note: The W10-11 sign is a W10-3 sign modified for geometrics. Other signs can be oriented or revised as needed to better portray the geometrics of the roadways and the tracks.
Highway/Rail Safety

• Signs

Figure 8B-6. Example of Placement of Warning Signs and Pavement Markings at Grade Crossings

Legend

- Direction of travel

A three-lane roadway should be marked with a center line for two-lane approach operation on the approach to a grade crossing.

If transverse lines are used at the grade crossing, yield lines may be used instead of stop lines if YELD signs are used at the grade crossing.

Stop line approximately 8 ft upstream from gate (if present)

On multi-lane roads, the transverse bands should extend across all approach lanes, and individual RXR symbols should be used in each approach lane.

`When used, a portion of the pavement marking symbol should be directly opposite the Advance Warning Sign (W19-1). If needed, supplemental pavement marking symbol(s) may be placed between the Advance Warning Sign and the grade crossing, but should be at least 50 feet from the stop or yield line.`

Note: In an effort to simplify the figure to show warning sign and pavement marking placement, not all required traffic control devices are shown.
Highway/Rail Safety

Signs

Figure 8B-2. Crossbuck Assembly with a YIELD or STOP Sign on the Crossbuck Sign Support

*Height may be varied as required by local conditions and may be increased to accommodate signs mounted below the Crossbuck sign

**Measured to the ground level at the base of the support

Notes:
1. YIELD or STOP signs are used only at passive crossings. A STOP sign is used only if an engineering study determines that it is appropriate for that particular approach.
2. Mounting height shall be at least 4 feet for installations of YIELD or STOP signs on existing Crossbuck sign supports.
3. Mounting height shall be at least 7 feet for new installations in areas with pedestrian movements or parking.
Highway/Rail Safety

• Contact Information:
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    • 225-379-1445
    • Trey.Jesclard@la.gov
  – Bill Shrewsberry, P.E.
    • 225-379-1543
    • William.Shrewsberry@la.gov
  – THANKS AGAIN!
Louisiana Local Technical Assistance Program (LTAP)

Marie Walsh, Director
Local Road Safety Program

- Outreach
- Training & education
- Technical assistance
  - Data analysis
  - Consultation
- Low cost safety improvement projects
LRSP Intersection Action Plan

- Analyzed local data (CRASH 3)
- Excluded highest crash parishes from initial analysis
- Set crash thresholds for selection
- Identified sites with potential
- Beginning process to implement
LRSP’s typical treatment for T-intersections
Roadway Departure Action Plan

- Analyzed available data (limited to spots & sections due to geographical info)
- Defined crash thresholds
- Identified 24 sections & 16 spot locations
- Made recommendations
Low Cost Recommendations

- Curve warning signs
- Advisory speed plates
- Chevron signs
- Flashing yellow beacons
- Center and edgeline striping
How Can You Help?

- Notify us of any specific sites that you know of that should be visited by our engineers
- Suggest sites for & participate in a Road Safety Audit (RSA)
- Participate in existing safety coalitions
- Multidisciplinary approach
Buckle Up Louisiana
No Excuses

- Coalition effort
- More local involvement
- Develop process for efficient outreach
- Collaboration between more stakeholders
- LMA & PJA Resolutions
- Need local leadership & participation
- May 24 – June 6, 2010
Contact Information

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Traffic Engineering 101

• Thank You!

• See you on April 26\textsuperscript{th} at 2:00 PM for Speed Management & School Areas