Monday, June 20, 2016
1:00 pm Opening Remarks & Roll Call
2:00 pm Project Updates - Chris Hedges (TRB)
2:45 pm Break
3:15 pm Presentations to SCOD
    ADA Transition Plans, Elizabeth Hilton (FHWA) and Louis Feagans, Jr. (INDOT)
    TCNMT Update to SCOD, Scott Woodrum (VA), Chair
    NCHRP 15-60, Update of the AASHTO Guide for the Development of Bicycle Facilities, Bill Schultheiss, Toole Design
    NCHRP 15-45, Update of the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
5:00 pm End of Day

Tuesday, June 21, 2016
8:00 am Joint General Session with TCED (See Main Agenda)
9:15 am Break
9:30 am Joint meeting with TRB Bicycle and Pedestrian Subcommittees
11:30 am Lunch
12:30 pm Joint meeting with TRB Bicycle and Pedestrian Subcommittees
3:00 pm Break
3:30 pm Update on AASHTO organizational changes, Carlos Bracersas (UT), Chair SCOD
4:00 pm Joint meeting between TCNMT and TCED (Louis Feagans)
5:00 pm End of Day

Wednesday, June 22, 2016
8:00 am Review previous day sessions with TRB Bicycle and Pedestrian Subcommittees
8:30 am Project Reports
    15-48, Guidelines for Designing Low- and Intermediate-Speed Roadways that Serve All Users, Marshall Elizer (Gresham, Smith, & Partners)
    15-52, Developing a Context-Sensitive Functional Classification System for More Flexibility in Geometric Design, Nick Stamatiadis (University of Kentucky)
    17-56, Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, Charlie Zegeer (UNC)
9:45 am Break (After break agenda may vary)
10:15 am TCNMT Discussion Topics
    Bike Share pros and cons, safety concerns due to the lack of helmet use, and use of tracking data.
    Increasing suburban bike/ped issues that don’t get as much attention as compared to those in urban environments.
    Suggestions on release of the Ped Guide. How to most appropriately reach the public about the release of the new Ped Guide? Webinar, pamphlets, etc.
11:00 am PROWAG Update, Scott Windley (Access Board)
Noon Lunch
1:00 pm Closing remarks and adjournment
TRB Divisions

- Technical Activities Division
- Studies and Special Programs Division
- Administration and Finance Division
- Cooperative Research Programs Division
- Strategic Highway Research Program 2
- NCHRP
- TCRP
- ACRP
- NCFRP
- HMCRP
- NCRRP
NCHRP: AASHTO’s Research Program Since 1962

Responsive to state DOTs

- Sole source of funds (5.5% of State Planning & Research)
- Largest submitter of problem statements
- Select which projects to fund

Focus on applied research

- Shared issues, usually nationally

Contract research

- Oversight/guidance by expert panels
- Research by contractors
- Facilitation by staff

Partnership between AASHTO, FHWA, & TRB
Typical NCHRP Projects

- Recommended AASHTO Guides and Specifications
- Guides for practitioners
- Software products
- New or improved models/tools
- New or improved operations and services
- New or improved testing/evaluation techniques
- Fact finding (white papers)
Typical Project Process

Call for problem statements issued on or about **July 1**

State DOTs, AASHTO Committees, & FHWA submit problem statements by **OCT 15**

State DOTs ballot on problems by February

AASHTO Standing Committee on Research selects projects in March
New Projects

IRP 07-25
Identify best practices for planning and designing pedestrian and bicycle accommodations at alternative intersections.

IRP 17-84
Develop better means to estimate crashes for walking and cycling to inform national safety improvements and countermeasure selection.

IRP 15-63
Develop guidance for transportation practitioners to improve pedestrian bicycle safety at intersections through design and operational treatments.
Active Projects

RP 15-60 (January 2018)

Create the AASHTO Guide for the Development of Bicycle Facilities -- to provide decision makers with current tools to improve bicycle safety and availability.

RP 08-102 (January 2018)

Offer inform decision making on the selection of bicycle facilities in the extent of community environments.

RP 17-73 (January 2018)

Develop a process for systematic analysis of pedestrian safety based on pedestrian behavior, roadway features, and contextual risk factors.
Pending Publications

IRP 03-78B
Develop guidelines for the installation of pedestrian crossing solutions at roundabouts and channelized turn lanes that address accessibility for pedestrians with vision disabilities.

IRP 17-56
Develop CMFs based on the relationships between pedestrian safety and crossing treatments at uncontrolled locations.

IRP 03-62
Develop guidelines and training materials for implementation of accessible pedestrian signals.
Pending Publications (cont’d)

HRP 15-45
Develop a proposed update of the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
Contractor’s report has been sent to AASHTO for balloting.
For more information ...

http://www.trb.org/nchrp/Pages/776.aspx
New focus on implementation ...

DURING THE PROJECT -- Products and activities that can be built into the contract, e.g. Guidebooks, PowerPoint presentations, marketing brochures, stakeholder consultation, workshops, ...

AFTER CONTRACT COMPLETION
- Workshops, demonstrations, presentations by panel members, journal articles, peer exchanges, ...
- Funding may be available post-contract for implementation
NCHRP Active Implementation

Moving Research INTO PRACTICE
Active Implementation

What is Active Implementation?

The formula for success involves multiplication. If any component is weak then the intended outcomes will not be achieved, sustained, or used on a socially significant scale.

Like a serum and a syringe, innovations are one thing and implementation is something else entirely different. Doing more research on a serum will not produce a better syringe; doing more research on an innovation will not produce better implementation methods.
Active Implementation Frameworks

Framework 1: Effective Products
- Well defined, effective products that are useable and implementable

Framework 2: Implementation Stages
- Developmental implementation guidance

Framework 3: Implementation Drivers
- Critical program and organizational support that is needed to implement products

Framework 4: Implementation Teams
- The group that guides and manages the implementation and scale-up process

Framework 5: Product Feedback
- The processes that support teams and organizations efficiently to solve problems and get better

Adapted from Dean Fixsen and Karen Blase
How to Evaluate Usability of Products

Hexagon Tool helps states, districts, and stakeholders ematically evaluate Usability of Products via six broad factors:

**Needs** of users; how well the product might meet identified needs.

**Fit** with current initiatives, priorities, structures and supports, and community values.

**Resource Availability** for training, staffing, technology support, curricula, data systems, and administration.

**Evidence** indicating the outcomes that might be expected if the product is implemented well.

**Readiness** for implementation

**Capacity** to implement as intended and to sustain and improve implementation over time.

Adapted from Karen Blase, Laurel Kiser, & Melissa K. Van Dyke, 2013
THE HEXAGON TOOL

Adapted from Karen Blase, Laurel Kiser, & Melissa K. Van Dyke, 2013

The scoring process is primarily designed to generate discussion and to help arrive at consensus for a factor as well as overall consensus related to moving forward or not. The numbers do not make the decision, the team does. Team discussions and consensus decision-making are required because different factors may be more or less important for a given program or practice and the context in which it is to be implemented.

Point Rating Scale

<table>
<thead>
<tr>
<th></th>
<th>High=5</th>
<th>Med=3</th>
<th>Low=1</th>
</tr>
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<td>Capacity</td>
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<tr>
<td>Evidence</td>
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</tbody>
</table>

Adapted from Karen Blase, Laurel Kiser, & Melissa K. Van Dyke, 2013
Relationship between Effective Product and Implementation Drivers

No matter how good the product may be, each of these drivers can impede or facilitate implementation.
Technology Transfer—Implementation Strategies

- Knowledge Transfer
- Training and Education
- Demonstrations and Showcases
- Communications and Marketing Efforts
- Technical Assistance
- Complex Process of Change
- Dealing with Technical Issues
- Dealing with Cultural Issues
## Funding Resources

There are at least 3 ways to fund implementation activities:

<table>
<thead>
<tr>
<th></th>
<th><strong>Pros</strong></th>
<th><strong>Cons</strong></th>
</tr>
</thead>
</table>
| Reserve certain amount in allocated project budget | • Panel discretion (i.e., at 1st panel meeting)  
• Guaranteed | • Limited funding |
| NCHRP 20-44         | • Additional funding to allocated project budget  
• Submitted after evaluation of final product(s) | • NCHRP 20-44 panel discretion  
• Compete with other Projects (i.e., funding is limited)  
• Must conform to NCHRP Active Implementation Criteria |
| Continuation request submitted to SCOR | • No limit on requested funding | • SCOR discretion  
• Once a year (i.e., request in October, decision in March) |
Thank you

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ADA Transition Plans

Presentation to AASHTO Subcommittee on Design
June 2016
Title II - State and Local Governments

Basic Requirement:
- Must ensure that individuals with disabilities are not excluded from programs, services, and activities (pedestrian facilities are an example of a program)
DOJ is primary Federal ADA implementing agency

- See DOJ regulations at 28 CFR Part 35
DOJ ADA Title II regulations require State and Local Governments to:

- Complete a self-evaluation of all facilities
- Develop & post of an ADA Policy Statement

For public entities with 50 or more employees*:
- Designate an ADA Coordinator
- Develop & post Grievance/Complaint Procedures
- Develop a Transition Plan

* No employee threshold under Section 504 regulations
Developing a Transition Plan

- Development will require:
  - Commitment of resources
  - Coordination with other entities (LPA, transit, etc.)
  - Periodic updating
- See DOJ regulations at 28 CFR 35.150(d)
Transition Plans:

- Address structural changes to existing facilities needed to achieve program accessibility
- Identify/list physical obstacles and their location
- Provide a schedule for making the access modifications (must go beyond repairs made as part of road capital improvement program)
- Describe the methods the entity will use to make the facilities accessible
- Name/position of the official who is responsible for implementing the Transition Plan (usually high level)
- Require public input
FHWA’s Focus on State ADA Transition Plans

- DOJ has delegated authority to DOT/FHWA
- Many States had not started on these plans
- Barriers to access continue to prevent people with disabilities from fully participating in society
- Equity
- Ladders of Opportunity
- STIP certifications
- All State DOT plans being reviewed by HQ team
FHWA’s Review Emphasis

- What are we looking for?
  - Good Faith Effort
  - Transparency
  - Outcome-oriented
  - Clear definition of jurisdictional issues (State vs. local responsibility), particularly for sidewalks
  - Intersections are top priority
  - Harmonize with transit access
Self-evaluation

- Has it been completed?
- If not, has it been started and is there a timely plan for completion?
- Does it include:
  - Sidewalks (slopes, obstructions, surface level discontinuities)
  - Curb ramps at street crossings
  - Pedestrian signals (effective communication)
  - Transit/bus stops (& access to stop)
  - On-street parking
  - Buildings and rest areas
  - Mixed-use trails
  - Discussion of jurisdictional issues
  - Public Involvement
Transition Plan: Schedule

- Commitment toward removing barriers
  - Prioritization process, especially for curb ramps
  - Public involvement
  - Keep schedule up to date
  - Annual schedule if more than one year to finish

- Accomplishing the work
  - As part of capital improvement projects (making additional improvements beyond what is otherwise required)
  - Set aside funds for standalone ADA projects (best practice)
Transition Plan: Methods

- Describe the methods that will be used to make existing facilities accessible
  - What standards does the agency follow?
  - Have your standard details been updated to comply with the standards you follow? Are they readily available to the public?
  - How do you address accessibility issues in the absence of a Federal standard?
  - What is your process for making determinations regarding structural impracticability or technical infeasibility?
  - How do you incorporate complaints about a particular location into your process?
Public Access to Information

- Post transition plan and links to key data prominently on website
- Public should be able to readily discern the barriers that have been identified and the schedule for removing those barriers.
- GIS map interface on the web is best practice
- Information must also be available to people without computer access - at DOT offices, etc.
Other ADA Requirements

- Public Involvement – process allowing public to provide input to self-evaluation and transition plan.
- ADA Policy Statement
- ADA Coordinator – Name and contact information
- Complaint/Grievance Process
Questions?
Americans with Disabilities Act
Indiana Transition Plan

Louis E. Feagans Jr. PE
Statewide Technical Service Director, Indiana DOT
Accomplishments (2015-16)

- ADA Program Manager
- Completion of the self inventory
- Development of a GIS layer for assets
- Development of a weighted asset database
- Development of a prioritization schedule
- Adoption of an INDOT ADA budget
- Common Paths Sidewalks Program for Local funding (part of current LPA call)
- Increased subrecipient monitoring (Title VI connection)
Commissioner

- Chief Counsel
  - ADA (\& Title VI) Program Manager
    - ADA (\& Title VI) Compliance Specialist
    - ADA Community Advisory Group: allows community participation (quarterly meetings)
    - Technical Advisory Committee: provides technical advice for design & construction staff
    - Network of Liaisons (defined in Title VI program) to ensure no discrimination occurs on basis of disability through INDOT programs.
  - Remediation of assets
ADA Community Advisory Working Group

This group is comprised of members of the community who have a demonstrated interest in advocating for the disabled community.

- Quarterly meetings
- Reviews and provides specific input regarding INDOT’s ADA Self-Evaluation and Transition Plan;
- Provided information on priority of assets needs and improvements
- Recommends means and methods for INDOT to increase the public involvement of persons with disabilities in transportation planning;
- Serves as a liaison between INDOT and the community.
ADA Assets Feature Prioritization Survey

- **General Prioritization** (existence of sidewalks, curb ramps, pedestrian signals)
- **Curb Ramps** (exist, receiving ramp, slope, transition, surface, cross slope, width, top landing, returned curbs, open grates, diagonal curb without landing, cross walks)
- **Detectable Warnings** (exist, location, proper depth, extend to edge of ramp, exposed drain, contrasting color, color can wear/rub off, loss of domes)
- **Sidewalks** (too narrow, too steep, cross slope, obstructions)
- **Pedestrian Signals** (exist, audible, height, pushbutton, distance, size, tactile, vibro-tactile)
The TAC answers internal questions and provides advice to designers, project managers, construction engineers, and INDOT staff when questions arise about the compliance of a particular asset or design.

- Monthly & Ad Hoc meetings
- Technical Infeasibility requests
- Technical Inquiry requests when full compliance is beyond the scope of a project.
Completion of the self-inventory

- Our inventory was originally taken on paper at the district level
- Data entry took years and involved many personnel from interns to managers
- Errors resulted which had to be corrected
- A field application is the goal with less room for user error and real-time updates
INDOT’s Inventory

Intersections - 7,547, comprised of:

- Curb ramps - 19,529 records
- Detectable warnings - 18,192 records
- Sidewalks - 21,195 records
- Pedestrian signals - 17,981 records
- Islands - 14,314 records
Development of a GIS layer

- Once the data (inventory) was entered for all curb ramps at each intersection of state road or highway, a GIS layer was developed.
- In this manner, locations requiring attention are mapped and made available for scoping and planning.
- When INDOT completes any project, this helps ensure that pedestrian facilities are addressed.
INDOT’s GIS Layer of ADA Assets:
The Weighted Asset Database

- Our Community Advisory Group helped determine how we prioritize assets.
- Initial guidance from FHWA included prioritizing assets close to school, hospitals, post offices, churches, etc.
- This “weighting” considered the components of each pedestrian facility, e.g. is having the proper ramp width or ramp slope more important?
<table>
<thead>
<tr>
<th>Compliance Element</th>
<th>Asset Type</th>
<th>Elements in Type</th>
<th>Asset Type Weight</th>
<th>Criteria Weight final</th>
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<tbody>
<tr>
<td>Curb Ramps at this Intersection?</td>
<td>Curb Ramp</td>
<td>21</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Curb Ramps without Types</td>
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<tr>
<td>Curb Ramps Slopes &gt;8.33%</td>
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<td>3</td>
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<td>Curb Ramps Transition Has No Transition</td>
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<td>6</td>
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<tr>
<td>Curb Ramps Transition Level &lt; .25&quot; or &gt; .50&quot;</td>
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<td>Built-up Curb Ramp Protrudes</td>
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### Sample Remediation Schedule

**Intersection Location, Weighting, DES #, Start and Finish Dates (INDOT Fiscal Year)**

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Defect Weighting</th>
<th>DES #</th>
<th>Start</th>
<th>Finish</th>
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<tr>
<td>INDOT ADA Transition Plan Task Schedule</td>
<td></td>
<td></td>
<td>Mon 7/3/17</td>
<td>Wed 6/30/17</td>
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<tr>
<td>Crawfordsville Targets</td>
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<tr>
<td>CRAWFORDSVILLE - Fountain County - ATTICA - US 41 at SR 28</td>
<td>817</td>
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<td>Sat 6/30/18</td>
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</table>
Once assets are scored or “weighted”, INDOT developed a prioritization schedule that considers not only an asset score but its proximity to other assets which also ranked poorly for accessibility.

For example if the 3rd asset on the list is in the same town as the 8th, 11th, 20th, 21st, and 30th … it is likely these would be programmed into a single project and addressed at the same time.
## Sample Compliance Target List

Intersection Location, Weighting, District Schedule, Project ID, Calculated Schedule

<table>
<thead>
<tr>
<th>District Name</th>
<th>1st Street</th>
<th>2nd Street</th>
<th>City</th>
<th>County</th>
<th>Defect Weighting</th>
<th>District Scheduled Completion Year</th>
<th>Project Identifier</th>
<th>Calculated Completion Year</th>
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</thead>
<tbody>
<tr>
<td>GREENFIELD</td>
<td>Eleventh ST</td>
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<td>RICHMOND</td>
<td>89 Wayne</td>
<td>1195.5</td>
<td>2018</td>
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## ADA Targets to be Improved with Existing Projects by District and City

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## Prioritization: Standalone ADA Projects

### ADA Compliance - Intersection Groupings by District and City

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INDOT’s budget is two fold:

- A budget to address pedestrian facilities as stand alone ADA projects as they appear in the prioritization schedule.
- An additional “budget” that is a commitment to perform at least a certain dollar amount of ADA remediation work as part of ongoing broader-scope and scale projects. (the Existing Projects example from the previous two slides.)
Common Paths

- $ for local communities to address ADA assets: Pilot Sidewalks Program
- Allows for corridor remediation
- INDOT can coordinate its projects with local projects
- Communities have underfunded ADA Transition Plans
Curb Ramp Design

- **Curb Ramp Dimensions**
  - Dimensions are no longer given on the Standard Drawings.
  - All Dimensions and slopes will be designed and shown on the construction plans.
  - All curb ramps, sidewalks and sidewalk driveway crossings will be designed and detailed in the stamped construction plans.
  - Curb ramps, sidewalks and sidewalk driveway crossings are to be designed in accordance with the Public Rights-of-Way Accessibility Guidelines (PROWAG)
Increased Local Monitoring

- Assurances of Nondiscrimination require INDOT to ensure locals are compliant with Title VI / ADA

  - Annual INDOT survey verifies existence of City/ Town / County level Transition Plans.
  - Desk review verifies survey responded
  - Risk-based audits look at quality, not just for components
  - Compliance OR a voluntary agreement to resolve deficiencies is required prior to funding.
Good or Bad?
Questions?

Contact for more information:
Louis Feagans Jr
Statewide Technical Services Director
(317) 232-5332
Lfeagans@indot.in.gov
Erin L. Hall, J.D.
Attorney / INDOT Title VI & ADA Program Manager
(317) 234-6142
Ehall2@INDOT.IN.Gov
Joint Technical Committee on Non-Motorized Transportation
2016 Update
Baltimore, MD
Joint Technical Committee on Non-Motorized Transportation

Chair: Scott Woodrum, VDOT

Vice Chair: Vacant, TBD

Secretary: Dan Goodman, FHWA

AASHTO Liaison: Jameelah Hayes
Joint Technical Committee on Non-Motorized Transportation

Membership Update:

• 1 Retirement – Tony Laird (WY) from Region 4

• Two vacancies recently filled from Region 4
  ○ Kenneth Brubaker (CO)
  ○ Rodger Gutierrez (OR)

• Remaining/New vacancies:
  ○ 1 in Region 1
  ○ 1 in Region 2
  ○ 1 in Region 3
<table>
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<td>Gabriela Contreras-Apodaca</td>
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Joint Technical Committee on Non-Motorized Transportation

Objective & Scope:

To advance the state of the practice in bicycle and pedestrian planning, design, traffic engineering, construction, operation, maintenance, and safety within the AASHTO member departments and nationally.
Joint Technical Committee on Non-Motorized Transportation

Publication Responsibility:

*Guide for the Development of Bicycle Facilities, 2012*

*Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2004*
Joint Technical Committee on Non-Motorized Transportation

Publication Updates


• Proposed Update of the Guide for the Development of Bicycle Facilities (15-60), Bill Schultheiss, Toole Design Group
Joint Technical Committee on Non-Motorized Transportation

Major Activities

1. Request/Compile Comments on the Proposed Update to the Ped Guide from:
   • SCOD
   • SCOTE

2. Ballot Final Draft of Ped Guide later this Summer

3. Facilitate the Update to the Bike Guide where appropriate
Joint Technical Committee on Non-Motorized Transportation

What’s going on at this meeting?

• Presentations to SCOD
• Joint meetings with TRB bike & ped subcommittees
• Joint Meeting with TCED
• Several Specific Project Updates
• PROWAG Update
Joint Technical Committee on Non-Motorized Transportation

Questions?
Joint Technical Committee on Non-Motorized Transportation

Publication Update:


First edition of the “Ped Guide” published in 2004
Joint Technical Committee on Non-Motorized Transportation

Advances since 2004:

• More Experienced Designers
• Research in planning, design, and operations
• Accessibility Requirements Revised
• New Traffic Control Devices
• Federal, State, and Local Agencies elevated the profile of pedestrian modes of travel
Joint Technical Committee on Non-Motorized Transportation

These factors led to NCHRP 20-7/Task 263 identifying needed revisions and additions.

- Comprehensive transportation systems
- Pedestrian scale development practices
- Pedestrian mobility – ingredient in supporting successful transit plans
Joint Technical Committee on Non-Motorized Transportation

TCNMT Review of 15-45 Final Report:

- September 2015 (Seattle) – kick-off review TC member’s comments. Meetings continued monthly via webx through January 2016
- TCGD submitted comments April 2016
Joint Technical Committee on Non-Motorized Transportation

Next steps for 15-45 Final Report:

1. The draft is uploaded to the SCOD portal for member review and comment (4 – 6 weeks)
2. SCOTE will also be providing comments concurrently during this period
3. All comments will be addressed by the Consultant (2 - 4 weeks)
Next Steps for 15-45 Final Report (cont’d):

4. Ballot by SCOD and SCOTE (4 – 6 weeks)
5. Ballot by SCOH (4 – 6 weeks)
6. After SCOH approval – into queue for publication (2 – 3 months)
Joint Technical Committee on Non-Motorized Transportation

Publication Update:


Questions?
9:30 am Opening Remarks
  • Purpose and Need of Collaboration
  • Anticipated Deliverables
  • Recap of Completed and Underway Research

10:30 am Break

10:40 am Development/Refinement of potential topics
  • Small group work sessions

11:30 am Lunch

12:30 pm Developing Narrative, Background Data & Documentation
  • Small group work sessions

1:30 pm Break

1:40 PM Report back to Joint Meeting with Topics

2:20 PM Break

2:30 pm Final assignments

3:00 pm Closing remarks and adjournment
NCHRP 15-48
Guidelines for Designing Low- and Intermediate-Speed Roadways that Serve All Users

Project Report
Technical Committee on Non-Motorized Transportation
Wednesday, June 22, 2016, 8:30am

NCHRP Project Manager: David Reynaud
Principal Investigator: Marshall Elizer, P.E., PTOE, Gresham, Smith and Partners
Research Team: GS&P, MRIGlobal, Alta Planning
Why this NCHRP project?

Difficulties within the roadway design profession with understanding and balancing the needs of all legal roadway users in the design of low- and intermediate-speed roadways (45mph and less), especially within urban, suburban, town/village main street and other contexts where service to motorized users must be effectively integrated with non-motorized users and the surrounding land use context.
Project 15-48 Objective

The objective of this research is to develop a set of integrated guidelines that will help designers accommodate all users in the design of low- and intermediate-speed roadways, including:

• Methods that can be used to identify the mix of users that need to be served on various roadway functional classifications (context, area types, etc.) and speed categories (low and intermediate speeds);

• A methodology supported by empirically based research (where available) that can balance and optimize how geometric design elements provide for safe and effective operation;

• Geometric design parameters for the types and designs of facilities to serve all users, and;

• Examples showing how facilities representing various roadway functional classifications and speed categories have been or could be designed effectively.
What are the considerations in designing for all users?

Balanced Multimodal Design

- Range & Priority of Users: Vehicles Trucks Buses Pedestrians Bicycles
- Performance: Safety, LOS, QOS, Accessibility, Convenience of All Users
- Functional Classification – Vehicle Mobility, Accessibility, Operations
- Speed: Design - Posted - Operating - Target
- Context Sensitivity – From Rural, Suburban to Dense Urban

The LEFT; Urban Planners, Place-Makers, New Urbanists

Traditional Vehicle-Focused Design

The RIGHT: DOT/Municipal Roadway Designers, traffic engineers, etc
DESIGN CONSIDERATIONS:

NETWORK (Vehicles, freight, transit, bicycle, pedestrian)
CONTEXT (Land use, aesthetics, target speed, modal priority)
MOBILITY* (Level of Service, all modes)
QUALITY of SERVICE* (Accessibility*, convenience, reliability*)
SAFETY* (All modes)

*NCHRP 785 Performance Categories

EXAMPLE: Urban-Suburban Minor Arterial
Project Status

Interim Report submitted late 2015, approved early 2016; approval to start Phase II in April 2016

Step 1: Develop DRAFT Guidelines Document (Task 8) - March-June 2016

Step 2: DRAFT Guidelines Review by TRB, Panel & Three (3) Selected Agencies (Task 8) - July 2016

Step 3: Revise DRAFT Guidelines to Preliminary FINAL Guidelines Document and Develop DRAFT Final Report (Task 8) - August 2016

Step 4: Preliminary FINAL Guidelines Review by TRB, Panel, and 12-15 Transportation Agencies (Task 9) - September 2016

Questions?

Thanks!
NC HRP 15-52
Developing a Context Sensitive Functional Classification System for More Flexibility in Geometric Design

Nikiforos Stamatiadis
Adam Kirk
Research Objective

♦ Review traditional functional classification scheme
♦ Revise functional classification scheme to facilitate contextual design
♦ Examine potential impacts of revised scheme on other areas
Background

- Federal Aid Act of 1921 – established national defense roads
- Federal Highway Act of 1973- Standardized functional classification system to assist in federal prioritization
- ISTEA established modern system
  - Principal Arterial-Interstate
  - Principal Arterial-Other Freeways and Expressway
  - Principal Arterial (Other)
  - Minor Arterial
  - Major Collector
  - Minor Collector
  - Local
- Context Urban / Rural
Access vs Mobility

![Diagram of Access vs Mobility]

- Proportion of Service
  - Mobility
  - Collectors
  - Locals

- Context
  - Access
  - Mobility

- Livability
Functional Classification

- Seven road categories, two context settings
- Simplicity both plus and minus
- Increased significance over time
- Constraint to contextual design
State of Practice Survey

38 States responding
Functional Classification Issues

- Increased role in project development
- Misaligned applications
  - When classification is defined
  - Use of design values as standards
  - Funding decisions
- Multimodal exclusion
  - Auto-centric approach
- Access vs. Mobility
  - Rural community “support”
  - Urban networks
Classification Shortcomings

♦ Lack of
  ● Land use recognition
  ● Balancing modal needs
  ● Recognition of suburban context
  ● Recognition of rural community Main Streets

♦ Encouragement of generalized design solutions
New Classification Objectives

♦ Primary
  ● Expand context definition beyond urban and rural
  ● Allow for multi-modal prioritization/accommodation

♦ Secondary
  ● Consider function in the overall network
  ● Ease of use
  ● Relate directly to FHWA/AASHTO functional classification
What Should FCS Determine?

♦ Roadway network needs
♦ Context constraints
♦ Vehicular speeds and mobility
♦ Bicycle separation
♦ Pedestrian activity
♦ Special use needs (Transit/Freight)
Current FCS Approach

- Traffic Volume
- Roadway width
- Right of way
- Other Modes

ROW
1552-FCS Approach

Traffic Volume  Other Modes

Right of way

Mode balance
Context Types

♦ Need to expand
♦ Defining elements
  ● Density
  ● Land use
  ● Building setbacks
# Context Types

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<th>Urban</th>
<th>Urban Core</th>
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- **Density**
  - Low
  - High

- **Building Setback**
  - Large
  - Small

[Images of different contexts]
Roadway Types

- Existing terms
- Defining element
  - Network function
  - Connectivity
Roadway Types

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</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Driver Accommodation

♦ Speed
  • Low (<30 mph)
  • Medium (30-45 mph)
  • High (>45 mph)

♦ Access levels
  • Low (>0.75 mi)
  • Medium (0.25-0.75 mi)
  • High (<0.25 mi)

♦ Mobility levels
  • Low
  • Medium
  • High
<table>
<thead>
<tr>
<th>Context</th>
<th>Roadway</th>
<th>Accommodation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td></td>
</tr>
<tr>
<td>Principal Arterial</td>
<td>H speed</td>
<td>H mobility-L access</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>H speed</td>
<td>H mobility-M access</td>
</tr>
<tr>
<td>Collector</td>
<td>M speed</td>
<td>M mobility-M access</td>
</tr>
<tr>
<td>Local</td>
<td>M speed</td>
<td>M mobility-M access</td>
</tr>
</tbody>
</table>
1552-FCS Driver Accommodation

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Context</th>
<th>Rural</th>
<th>Rural Town</th>
<th>Suburban</th>
<th>Urban</th>
<th>Urban Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Arterial</td>
<td></td>
<td>H speed</td>
<td>L/M speed</td>
<td>M/H speed</td>
<td>L/M speed</td>
<td>L speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H mobility-</td>
<td>M mobility-</td>
<td>M mobility-</td>
<td>M mobility-</td>
<td>M mobility-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L access</td>
<td>H access</td>
<td>M access</td>
<td>M access</td>
<td>M access</td>
</tr>
</tbody>
</table>

Target Speed

Mobility

Access

Speed, Mobility and Accessibility levels: H: High; M: Medium; L: Low
# Bicyclist Accommodation

<table>
<thead>
<tr>
<th>Connector Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citywide Connector</td>
<td>Citywide connections or connections to major activity centers or regional bike routes stretching over several miles attracting high bike volumes</td>
</tr>
<tr>
<td>Neighborhood Connector</td>
<td>Neighborhood or sub-area connections allowing access to higher order facilities or local activity centers</td>
</tr>
<tr>
<td>Local Connector</td>
<td>Local connections of short length providing internal connections to neighborhoods or connect to higher order facilities</td>
</tr>
</tbody>
</table>

- **Separation**
  - High
  - Medium
  - Low
**1552-FC S Bicyclist Accommodation**

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Rural</th>
<th>Rural Town</th>
<th>Suburban</th>
<th>Urban</th>
<th>Urban Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Arterial</td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
<td>LC: L separation; NC: M separation; CC: M separation</td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
<td>LC: L separation; NC: M/H separation; CC: M separation</td>
<td>LC: L separation; NC: M separation; CC: M separation</td>
</tr>
</tbody>
</table>

**Bicycles**

Bicycle classification levels CC: Citywide Connector; NC: Neighborhood Connector; LC: Local Connector
Separation levels: L: Low., M: Medium, H: High
Pedestrian Accommodation

♦ Traffic
  ● P1 (Rare/Occasional)
  ● P2 (Low)
  ● P3 (Medium)
  ● P4 (High)

♦ Sidewalk width
  ● Not Appropriate
  ● Minimum
  ● Wide
  ● Enhanced

♦ Separation
1552-FCS Composite Cell

- **Context**
  - **Rural**

- **Roadway**
  - **Principal Arterial**
    - H speed
    - H mobility - L access
    - LC: L separation;
      NC: M separation;
      CC: H separation
    - P1: NA; P2: Min;
      P3, P4: Wide
### 1552-FC S Matrix

<table>
<thead>
<tr>
<th>Context</th>
<th>Roadway</th>
<th>Rural</th>
<th>Rural Town</th>
<th>Suburban</th>
<th>Urban</th>
<th>Urban Core</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Principal Arterial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H speed</td>
<td>L/M speed</td>
<td>M/H speed</td>
<td>M speed</td>
<td>L/M speed</td>
<td>L speed</td>
</tr>
<tr>
<td></td>
<td>H mobility-L access</td>
<td>M mobility-H access</td>
<td>M mobility-M access</td>
<td>M speed</td>
<td>M mobility-M access</td>
<td>M mobility-M access</td>
</tr>
<tr>
<td></td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
<td>LC: L separation; NC: M separation; CC: H separation</td>
</tr>
<tr>
<td>P1; NA</td>
<td>P2; Min</td>
<td>P3; P4: Wide</td>
<td>P2; Min; P3: Wide; P4: Enhanced</td>
<td>P1; NA; P2; Min; P3: Wide; P4: Enhanced</td>
<td>P2; Min; P3: Wide; P4: Enhanced</td>
<td>P3: Wide; P4: Enhanced</td>
</tr>
</tbody>
</table>

| **Minor Arterial** |         |       |            |          |       |            |
|         | H speed | L/M speed | M/H speed | M speed | L/M speed | L speed |
|         | H mobility-M access | M mobility-H access | M mobility-M access | M speed | M mobility-M/H access | M mobility-M access |
|         | LC: L separation; NC: M separation; CC: H separation | LC: L separation; NC: M separation; CC: H separation | LC: L separation; NC: M separation; CC: H separation | LC: L separation; NC: M separation; CC: M separation | LC: L separation; NC: M separation; CC: M separation | LC: L separation; NC: M separation; CC: M separation |
| P1; P2 | Min | P3; P4: Wide | P2; Min; P3: Wide; P4: Enhanced | P1; NA; P2; Min; P3: Wide; P4: Enhanced | P2; Min; P3: Wide; P4: Enhanced | P3: Wide; P4: Enhanced |

| **Collector** |         |       |            |          |       |            |
|         | M speed | L speed | M speed | L speed | M speed | L speed |
|         | H mobility-M access | M mobility-H access | M mobility-M access | M mobility-H access | M mobility-H access | M mobility-H access |
|         | LC: L separation; NC: CC: M separation | LC: NC; L separation; CC: M separation | LC: NC; L separation; CC: M separation | LC: NC; L separation; CC: M separation | LC: NC; L separation; CC: M separation | LC: NC; L separation; CC: M separation |
| P1; P2 | Min | P3; P4: Wide | P2; Min; P3: Wide; P4: Enhanced | P1; NA; P2; Min; P3: Wide; P4: Enhanced | P2; Min; P3: Wide; P4: Enhanced | P3: Wide; P4: Enhanced |

| **Local** |         |       |            |          |       |            |
|         | M speed | L speed | M speed | L speed | L speed | L speed |
|         | H mobility-M access | M mobility-H access | L speed | L mobility-H access | L speed | L mobility-H access |
|         | LC; NC; CC: L separation | LC; NC; CC: L separation | LC; NC; CC: L separation | LC; NC; CC: L separation | LC; NC; CC: L separation | LC; NC; CC: L separation |
| P1; P2 | Min | P3; P4: Wide | P2; Min; P3: Wide; P4: Enhanced | P1; NA; P2; Min; P3: Wide; P4: Enhanced | P2; Min; P3: Wide; P4: Enhanced | P3: Wide; P4: Enhanced |

---

**Speed, Mobility, Accessibility and Separation levels:**
- **H:** High; **M:** Medium; **L:** Low
- **Bicycle Connectors:** **LC:** Local; **NC:** Neighborhood; **CC:** Citywide
- **Pedestrian traffic levels:** **P1:** rare/occasional; **P2:** low; **P3:** medium; **P4:** high
- **Pedestrian facility width:** **NA not appropriate; Min:** minimum; **Wide:** greater than minimum; **Enhanced:** wide for large congregating pedestrian groups
- **Pedestrian facility separation should be considered in conjunction with driver target speeds**
1552-FC S Summary

- Based on existing schemes
  - Pennsylvania/New Jersey
  - Minnesota
  - City of Chicago
  - ITE-CNU
  - FHWA
- Meets FCS objectives
- Improves context definition
- Aids design domain choices
Questions

♦ Nick.Stamatiadis@uky.edu
♦ Adam.Kirk@uky.edu
NCHRP 17-56: Development of Crash Reduction Factors for Uncontrolled Pedestrian Crossing Treatments
Presentation Overview

- Team Overview/Project Background
- Treatment Types
- Task Approach & Data collection
- Results and CMF development
- Implementation Opportunities
- Questions/Discussion
# Team Overview – Project Team

<table>
<thead>
<tr>
<th>Team Member</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlie Zegeer, HSRC</td>
<td>Project PI</td>
</tr>
<tr>
<td>Raghavan Srinivasan, HSRC</td>
<td>Statistical Analysis</td>
</tr>
<tr>
<td>Daniel Carter, HSRC</td>
<td>Oversee Data Collection</td>
</tr>
<tr>
<td>Carl Sundstrom, HSRC</td>
<td>City &amp; Site Selection</td>
</tr>
<tr>
<td>Sarah Smith, HSRC</td>
<td>Project Coordination</td>
</tr>
<tr>
<td>Kittelson and Associates, Inc (John Zegeer, Erin Ferguson)</td>
<td>Data Collection &amp; Implementing Results</td>
</tr>
<tr>
<td>Persaud &amp; Lyon, Inc</td>
<td>Statistical Analysis</td>
</tr>
<tr>
<td>CERS (Ron Van Houten)</td>
<td>Technical Advisor</td>
</tr>
</tbody>
</table>
Evaluation of Four Treatment Types

1. Un-signalized advance yield or stop signs and pavement markings (AS)
2. High-intensity activated crosswalk (HAWK) signals (PHB)
3. Rectangular rapid flashing beacons (RRFB’s)
4. Pedestrian refuge islands (RI)
The 14 cities which were selected:

| Alexandria, VA | Arlington, VA |
| Cambridge, MA   | Chicago, IL   |
| New York City, NY | Miami, FL    |
| St. Petersburg, FL | Tucson, AZ  |
| Scottsdale, AZ   | Phoenix, AZ   |
| Portland, OR     | Eugene, OR    |
| Charlotte, NC    | Milwaukee, WI |
Data Collection
Cities and Sites by Treatment Type
Advanced Yield or Stop Markings and Signs

Advance yield line (shark’s teeth) & sign

Advance stop line and sign

2009 MUTCD Section 3B.16 and Figure 3B-17

2009 MUTCD Section 3B.16
Pedestrian Hybrid Beacon

2009 MUTCD Chapter 4F Pedestrian Hybrid Beacons
Rectangular Rapid Flashing Beacons

- Beacon is yellow, rectangular, and has a rapid “wig-wag” flash
- Beacon located between the warning signs and the arrow plaque
- Must be pedestrian activated (push button or passive)
- Beacons required on both right and left sides or in a median (if practical)
Pedestrian Refuge Areas

Crossing island at marked crosswalk – breaks long complex crossing into two simpler crossings
**Total Treatment and Comparison Sites**

<table>
<thead>
<tr>
<th>CITY</th>
<th>Treatment</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Petersburg, FL</td>
<td>116</td>
<td>45</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Tucson, AZ</td>
<td>85</td>
<td>65</td>
</tr>
<tr>
<td>Charlotte, NC</td>
<td>36</td>
<td>112</td>
</tr>
<tr>
<td>Miami, FL</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>Scottsdale, AZ</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>Milwaukee, WI</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Portland, OR</td>
<td>61</td>
<td>33</td>
</tr>
<tr>
<td>New York, NY</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td>Arlington &amp; Alexandria, VA</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>Eugene, OR</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>Cambridge, MA</td>
<td>19</td>
<td>26</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>509</strong></td>
<td><strong>485</strong></td>
</tr>
</tbody>
</table>
## Treatment Combinations

<table>
<thead>
<tr>
<th>Treatment Combination Type</th>
<th>Number of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS</td>
<td>98</td>
</tr>
<tr>
<td>PHB</td>
<td>3</td>
</tr>
<tr>
<td>RRFB</td>
<td>5</td>
</tr>
<tr>
<td>RI</td>
<td>203</td>
</tr>
<tr>
<td>AS+PHB</td>
<td>57</td>
</tr>
<tr>
<td>AS+RRFB</td>
<td>26</td>
</tr>
<tr>
<td>AS+RI</td>
<td>59</td>
</tr>
<tr>
<td>RI+RRFB</td>
<td>4</td>
</tr>
<tr>
<td>AS+RRFB+RI</td>
<td>17</td>
</tr>
<tr>
<td>AS+PHB+RI</td>
<td>37</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>509</strong></td>
</tr>
</tbody>
</table>

- **309 Sites with one treatment**
- **146 Sites with two treatments**
- **54 Sites with three treatments**
Data Collection
Site Characteristics

- Relevant geometric and volume data was collected for each site.

- Other features also collected using Google Earth imagery and site photographs (signage, crosswalk type, number of lanes, intersection vs midblock, area type, transit association).

- Site characteristic histories and changes were recorded as far back as Google Earth Imagery would allow (generally 10 years).
Number of Lanes

<table>
<thead>
<tr>
<th>Number of Sites</th>
<th>Treatments</th>
<th>Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>140</td>
<td>88</td>
</tr>
<tr>
<td>3</td>
<td>69</td>
<td>54</td>
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<tr>
<td>4</td>
<td>163</td>
<td>154</td>
</tr>
<tr>
<td>5</td>
<td>96</td>
<td>168</td>
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<tr>
<td>6</td>
<td>30</td>
<td>13</td>
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<td>7</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>0</td>
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</table>

Number of Lanes

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2 lanes</td>
<td>≥ 3 lanes</td>
</tr>
<tr>
<td>141</td>
<td>28%</td>
</tr>
<tr>
<td>≤ 2 lanes</td>
<td>≥ 3 lanes</td>
</tr>
<tr>
<td>88</td>
<td>18%</td>
</tr>
</tbody>
</table>
Intersection vs Mid-block

<table>
<thead>
<tr>
<th>Number of Sites</th>
<th>Treatment</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection</td>
<td>350</td>
<td>363</td>
</tr>
<tr>
<td>Midblock</td>
<td>159</td>
<td>122</td>
</tr>
<tr>
<td>Total</td>
<td>509</td>
<td>485</td>
</tr>
</tbody>
</table>
Transit Association

<table>
<thead>
<tr>
<th>Number of Sites</th>
<th>Treatment</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit Stop (Yes)</td>
<td>209</td>
<td>241</td>
</tr>
<tr>
<td>Transit Stop (No)</td>
<td>300</td>
<td>244</td>
</tr>
<tr>
<td>Total</td>
<td>509</td>
<td>485</td>
</tr>
</tbody>
</table>

- Treatment Sites:
  - Yes: 41%
  - No: 59%
- Comparison Sites:
  - Yes: 50%
  - No: 50%
CMF Development

• Quantify the relationship between pedestrian safety and crossing treatments at uncontrolled locations

• Develop Crash Modification Factors (CMFs) or functions (CMFunctions) for four treatments
CMF Development
Possible Approaches

• Two possible approaches for estimating CMFs:

  1. Before-After analysis using empirical Bayes or full Bayes method

  2. Cross-section regression modelling
CMF Development
Before-After Method Issues

• Two problems with relying solely on before-after analysis method
  1. Unavailability of before treatment pedestrian volumes at most of the treated sites (treatment itself may significantly change pedestrian exposure)
  2. The difficulty in obtaining sufficiently large samples of sites with a particular treatment or treatment combination
CMF Development
Cross-sectional Models

• Negative-binomial regression models

• Used in Zegeer et al. (2005) FHWA on marked vs. unmarked crosswalks

• NCHRP 17-26 included in Chapter 12 of the Highway Safety Manual
CMF Development
Cross-sectional Models

- Cross-sectional models may produce less reliable CMFs
  - Confounding
  - Correlation between different variables
- Alternative regression models with and without selected factors
- Nearby comparison sites without the treatment
- Flexible functional form
- Data from multiple jurisdictions were combined for the same treatment to provide more reliable CMFs
**Study Results**

**CMFs for Pedestrian Crashes**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CMF</th>
<th>Source (Before-after and/or Cross-section study)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refuge Islands</td>
<td>0.68</td>
<td>2 studies</td>
</tr>
<tr>
<td>Advance Yield/Stop Sign</td>
<td>0.75</td>
<td>2 studies</td>
</tr>
<tr>
<td>PHB</td>
<td>0.45</td>
<td>2 studies</td>
</tr>
<tr>
<td>RRFB</td>
<td>0.53*</td>
<td>Cross-section study</td>
</tr>
</tbody>
</table>

*Based on a very limited sample size*
NCHRP 17-56 Implementation Opportunities

• AASHTO’s Highway Safety Manual, second edition (HSM-2)

• FHWA CMF Clearinghouse

• FHWA Proven Safety Countermeasures website

• NCHRP Report 600 Human Factors Guidelines for Road Systems, Second Edition

• Manual on Uniform Traffic Control Devices (MUTCD)

• Design guidance for uncontrolled pedestrian crossings
Questions?