COMPLETE STREETS
SAFETY ASSESSMENTS

Presented by
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Each year, over 35,000 motorists, pedestrians, and bicyclists die

Pedestrian and bicyclist fatalities represent about 15% of total

The United States averages almost 5,000 pedestrian and bicycle fatalities per year or one every two hours
The objectives of pedestrian and bicycle assessments are to enable communities to:

- Improve pedestrian and bicycle safety at specific locations and community-wide
- Create safe, comfortable, accessible, and welcoming environments for pedestrians
- Enhance walkability/bicycling, livability, and economic vitality
Assessment Process

- Identify locations in the community for review
- Obtain relevant information from the responsible local agency during pre-visit interviews
- Convene a meeting with key local agency staff and other stakeholders
- Perform field audits and reviews under various conditions
- Identify best practices
- Benchmark the responsible local agency’s policies, programs, and practices
- Prepare a technical report
Potential Focus Areas

➢ Highest intersections with pedestrian and bicycle collisions
➢ Highest corridors with pedestrian and bicycle collisions
➢ Pedestrian and bicycle circulation issues and conflict points
➢ School circulation issues – vehicle/pedestrian conflicts
➢ Cut through traffic on residential streets – WAZE impacts
➢ Evaluation of previously identified solutions (roundabouts)
➢ Evaluation of recently constructed improvements
➢ Traffic signal timing and railroad Xings
Suggest Pre-Site Visit Conference Call

- Takes place about three weeks before site visit
- Should take no more than one hour
- Include key stake holders from agency
- Discuss final report and ownership
- Record who participates in call (Sign-up sheet)
- Confirm of time and locations for initial and subsequent meetings
- Scope of work for site visit – field audit locations
- Completion of Benchmarking Analysis Survey
- Available data to be provided by agency prior/during to site visit
Data Request Check List

- Inventory of curb ramps
- Inventory of missing sidewalks, informal pathways, missing connections
- List of programmed roadway improvements
- Locations of school crossing guards
- Information on planned developments and redevelopment areas
- Key land use features that influence crossing streets from key buildings
- Transit maps, including schedules
- Truck types and volumes on key roads
- Trails, greenways, and bike lanes
- Schools and safe routes to school
Constantly flashing beacons needs upgrading

Crossing guard run over
Document Request Check List

- General Plan (especially the circulation element and parks and trails elements)
- Relevant land use plans
- Zoning ordinances and maps
- Bicycle and pedestrian master plans
- Traffic calming program
- Recent development proposals
- Recent traffic studies
- Greenway/Trail master plans
- Parks and open space master plans
- Transit master plans
- Other regional transportation plans
- Community policies for bikeways, bike parking
- Land use maps (existing and planned)
What Should the Benchmarking Analysis Survey Include?
NHTSA uses benchmarking as a tool to evaluate safety programs. To create a benchmark, the evaluators analyze the local agency’s responses to the pre-visit survey of the community's pedestrian and bicycle policies, programs which fall into four overarching areas:

- Bikeway Planning, Design & Maintenance
- General Plan/ Specific Plan Policies, City Standards & Ordinances
- Procedures, Practices & Programs Regarding Traffic and Transportation
- Intra- and Inter-Department Coordination and Cooperation
The community's pedestrian and bicycle policies, programs, and practices are then compared with national best practices and categorized into three groups:

- **Key strengths:** Area where the community is exceeding national best practices
- **Enhancements:** Area where the community is meeting best practices
- **Opportunities:** Area where the community appears not to meet best practices

These three groupings allow the agency to determine how well it is doing compared to the best practices in other communities when it comes to providing complete streets which do their best to accommodate all road users.
# Complete Streets Survey Responses

<table>
<thead>
<tr>
<th>Benchmark Topic</th>
<th>Key Strength</th>
<th>Enhancement</th>
<th>Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Use of Leading Pedestrian Intervals (LPI)</td>
<td>Has installed LPIs at appropriate locations</td>
<td>Has installed some LPIs</td>
<td>Has not installed LPIs</td>
</tr>
<tr>
<td>2 Inventory of sidewalks, informal pathways, and key pedestrian opportunity areas</td>
<td>Maintain an inventory of missing and existing sidewalks and includes sidewalk projects in the CIP</td>
<td>Maintain an inventory of missing sidewalks, informal pathways, and/or pedestrian opportunity areas</td>
<td>Does not have an inventory of missing sidewalks. Informal pathways, or pedestrian opportunity areas</td>
</tr>
<tr>
<td>3 Pedestrian Master Plan</td>
<td>Has a recently-updated Plan and pedestrian projects have been completed recently</td>
<td>Has a Pedestrian Master Plan but it may be outdated and/or no recent projects from the Plan have been completed</td>
<td>Does not have a Pedestrian Master Plan</td>
</tr>
<tr>
<td>4 Bicycle Master Plan</td>
<td>Has a recently-updated Plan and bicycle projects have been completed recently</td>
<td>Has a Bicycle Master Plan but it may be outdated and/or no recent projects from the Plan have been completed</td>
<td>Does not have a Bicycle Master Plan</td>
</tr>
<tr>
<td>5 Implementation of Americans with Disabilities Act (ADA) Improvements and ADA Transition Plan for Streets and Sidewalks</td>
<td>Uses state-of-the-practice ADA improvements with consistent installation practices</td>
<td>Has clear design guidelines but no regular practices for ADA compliance</td>
<td>No transition plan or ADA coordinator</td>
</tr>
</tbody>
</table>

Source: Technical Guide For Conducting Pedestrian Safety Assessments For California Communities
Are State-of-the Practice ADA Improvements with Consistent Installation Practices Applied?

Example of Two Curb Ramps per Corner
Are colored bike lanes being provided in high conflict zones?
Site Visit Process

➢ Takes place over a two day period
➢ Begins with an initial meeting of all the stakeholders
➢ Tour of agency to review ped and bike incident locations
➢ Review often includes schools, high ped/bike generators, railroad crossings, locations of future capital projects
➢ Law enforcement officer meets with agency officers if requested by agency
➢ Exit meeting held on second day to report preliminary findings
➢ Final report prepared based on exit meeting discussions
Initial Meeting for Site Visit

➢ Self introductions of key stakeholders and role in assessment
➢ Information about key stakeholders (Sign-up sheet)
➢ Review of collision data for identification of study locations
➢ Scope of work for site visit - specific locations for field audit
➢ Review field audit locations using Google Earth/Street View/GIS
➢ Other data obtained since conference call
➢ Any other available data
➢ Benchmarking analysis survey responses
➢ Final meeting and reporting of preliminary results
Potential Participants/Stake Holders

- Elected officials
- Bicycle or pedestrian coordinator
- Police traffic safety enforcement officer
- Engineering or public works department staff
- ADA coordinator
- Transit services staff (if transit is present in the focus area)
- Business leaders or residents in focus areas
- Business associations
- Residents or neighborhood associations
- Downtown or neighborhood planners or redevelopment agency staff
- User group or advocacy group representatives (such as a bicycling or traffic calming advocacy group)
- School officials and PTA leaders
- Parks and recreation staff
- Parking management staff
- Health agencies and organizations including emergency medical services
Review of study locations at initial meeting prior to field audit

Google Earth/Street View
How Can Walking Audits Identify Pedestrian Mobility/Safety Issues?
Example of a Walking Route for a Pedestrian Walking Audit.
Principal Stake Holders Should Be Present
Walking Audit Check Lists (Good Streets)

- Are the sidewalk environments continuous and wide enough for two people?
- Buffered from traffic with landscape strips?
- Shaded with street trees?
- Are lanes narrow (10–11 feet) or appropriate for the area type (neighborhood, commercial, downtown, etc.)?
- Are medians present?
- Are bicycle accommodations (bicycle lanes, signs, etc.) provided?
- Is the number of lanes appropriate for the traffic volume?
- If there are one-way streets, are motorists’ speeds and yielding behaviors supportive of walking?
Walking Audit Check Lists (Good Crossings)

• Are crossings highly visible, with curb extensions, low profile landscaping, and high visibility markings?
• Are crossings marked and signed?
• Are high-emphasis crosswalk markings used on arterial streets?
• Are quasi-signals, such as in-pavement lighting or beacons, used where appropriate?
• If the crossing has multiple lanes, is the stop or yield bar set back from the crossing?
• Is there adequate lighting?
• If the crossing has multiple lanes, is there a median separating the crossing from each conflict direction?
Pedestrian Hybrid Signal With Effective Back Plates (Needs an R10-23)
Walking Audit Check Lists (Good Intersections)

- Are intersections compact (with curb extensions or refuge islands)?
- Are crosswalks provided on all approaches?
- At signalized intersections:
  - Are pedestrian priority signals (leading pedestrian intervals or scrambles) provided?
  - Are conflicts in crosswalks limited by prohibiting right turns on red or with protected left turn phases?
  - Are advance limit lines provided?
  - Are countdown signals provided
Walking Audit Check Lists (Economic Vitality)

- Façade improvements
- Redevelopment sites for mixed-use development
- Adding streetscapes and street furniture, sidewalk cafes
- Relocating parking behind buildings
- Parking management strategies
- Connecting commercial areas to open
- Traffic calming
- Wayfinding enhancements and establishing a sense of place
- Transit-oriented development
- Bringing “feet to the pavement” in the evenings, on weekends, mid-day, and so on (land use mix of theaters, restaurants, gyms, residential, and offices)
Downtown street – local traffic and pedestrians only
Night Time Walking Audit Warning

- A nighttime audit is conducted when pedestrian collision data indicate that collisions in a focus area are occurring after dark or during sunrise or sunset times.

- The Walking Audit Checklist can be followed, with particular emphasis on nighttime issues, such as lighting or activities that generate nighttime pedestrians, like movie theaters or bars.

- Evaluators can conduct the audit by observing conditions at the focus area from a parked vehicle.

- The audit might include observations of impaired or distracted pedestrians and their behavior and apparel (whether visible at night), as well as impaired or distracted motorists.
What is wrong here?
Case Studies of Pedestrian Field Audits
Existing Conditions at Light Rail Station Intersection

- The intersection is controlled by traffic signal

- A separate left-turn phase is provided for the southbound approach of the intersection to turn onto freeway ramp and frontage road

- There is a Light Rail station located underneath freeway right at the intersection

- The pattern of pedestrian collisions primarily involves southbound drivers continuing to turn left even after the left-turn signal has turned red and pedestrians have begun to cross in the crosswalk on the east leg of the intersection.
Left-turn traffic violates red arrows and peds are injured

Participants - what is operational solution?
Intersection Controlled by Stop Signs on Side Street
Suggested Improvements

• Close off the southbound left-turn lane to create a wide pedestrian refuge area in the median if left turn volumes during regular and school peak hours are less than 50 vehicles per hour.

• The southbound left-turn movement would have to be restricted. Drivers would be diverted to adjacent intersections which appear to have adequate capacity to absorb this kind of diversion.

• Consider installing a Hawk Beacon or Rectangular Rapid Flashing Beacons to make drivers more aware of the presence of a pedestrian in the crosswalk.
Proposed Geometric Modifications for Intersection
Existing Conditions at Three Adjacent Uncontrolled Crosswalks

- There are three marked crosswalks not controlled by stop signs or traffic signals.
- The crosswalks are marked with high visibility striping and are heavily used by pedestrians.
- Four travel lanes for through traffic between 10,000 and 12,000 vehicles per day
- Volumes makes road a good candidate for a “Road Diet” restriping – restriping a road with four travel lanes into two travel lanes, providing a center turn and bike lanes.
- Road diet will provide bike lanes, turn lanes and one thru lane. This will eliminate the multiple threat issue.
Existing Conditions at Three Uncontrolled Intersections

Participants - What could be done better?
Bus stop better on far side for sight distance
Suggested Improvements

- Provide curb extensions/refuge islands
- Provide FYG signs at all three crosswalks in both directions
- Install rectangular rapid flash beacons
- Provide advance limit lines
- **Restrict parking on approaches for better sight distance**
- Access ramps at both ends of each crosswalk
- Advance X Walk Ahead legends
- City Submitted Report for an ATP Grant - $4,000,000
One way street
Proposed Road Diet
Redesign Intersection at one way street
What are Potential Locations for Bicycle Improvements
Windshield Audit Checklist

• During a windshield audit, roadway and bicycle conditions are observed while driving through the focus areas.

• Appropriate for areas that are geographically dispersed or too large to observe on foot.

• Provides an important view of the focus area from the driver’s perspective.

• The Walking Audit Checklist is used throughout the driving tour, as applicable.

• Each vehicle should have a non-participant driver.

• Ideally, all participants should travel in the same vehicle to facilitate group discussions during the audit.
Virtual Biking Audit Tour Image

Source: Technical Guide For Conducting Bicycle Safety Assessments For California Communities
Bicycle Crash Countermeasures

➢ Provide on street striped bike lanes
➢ Implement bicycle timing at traffic signals
➢ Encourage bicyclists to ride with traffic
➢ Colorized treatments to distinguish bike lanes
➢ Provide better markings at intersections
➢ Providing warning to drivers making turns
➢ Remove parking
➢ Establish Bike Boulevards
➢ Provide better crossings for bike paths
Are bike lanes provided where needed?
Are Road Diets Being Considered?

Source: City of Pasadena Pedestrian Safety Study at Signalized Intersections
Are there major barriers to ped and bike circulation?
Table 4D-109(CA) Signal Operations - Minimum Bicycle Timing (English Units)

\[ G_{\text{min}} + Y + R_{\text{clear}} \geq 6 \text{ sec} + (w+6 \text{ ft})/14.7 \text{ ft/sec}, \]

- \( G_{\text{min}} = \) Length of minimum green interval (sec)
- \( Y = \) Length of yellow interval (sec)
- \( R_{\text{clear}} = \) Length of red clearance interval (sec)
- \( W = \) Distance from limit line to far side of last conflicting lane (ft)

<table>
<thead>
<tr>
<th>Distance from limit line to far side of last conflicting lane</th>
<th>Minimum phase length (minimum green plus yellow plus red clearance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet</td>
<td>Seconds</td>
</tr>
<tr>
<td>40</td>
<td>9.1</td>
</tr>
<tr>
<td>50</td>
<td>9.8</td>
</tr>
<tr>
<td>60</td>
<td>10.5</td>
</tr>
<tr>
<td>70</td>
<td>11.2</td>
</tr>
<tr>
<td>80</td>
<td>11.9</td>
</tr>
<tr>
<td>90</td>
<td>12.5</td>
</tr>
<tr>
<td>100</td>
<td>13.2</td>
</tr>
<tr>
<td>110</td>
<td>13.9</td>
</tr>
<tr>
<td>120</td>
<td>14.6</td>
</tr>
<tr>
<td>130</td>
<td>15.3</td>
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<tr>
<td>140</td>
<td>15.9</td>
</tr>
<tr>
<td>150</td>
<td>16.6</td>
</tr>
<tr>
<td>160</td>
<td>17.3</td>
</tr>
<tr>
<td>170</td>
<td>18.0</td>
</tr>
<tr>
<td>180</td>
<td>18.7</td>
</tr>
</tbody>
</table>

**Guidance:**

Where a Limit Line Detection Zone that detects the Reference Bicycle-Rider has been provided, minimum bicycle timing should be provided as follows:

For all phases, the sum of the minimum green, plus the yellow change interval, plus any red clearance interval should be sufficient to allow a bicyclist riding a bicycle 6 ft long to clear the last conflicting lane at a speed of 14.7 ft/sec plus an additional effective start-up time of 6 seconds, according to the formula:

\[ G_{\text{min}} + Y + R_{\text{clear}} \geq 6 \text{ sec} + (w+6 \text{ ft})/14.7 \text{ ft/sec}, \]

- \( G_{\text{min}} = \) Length of minimum green interval (sec)
- \( Y = \) Length of yellow interval (sec)
- \( R_{\text{clear}} = \) Length of red clearance interval (sec)
- \( W = \) Distance from limit line to far side of last conflicting lane (ft)
Video Detection Replaces Loops
*(in ground bike loops not detecting newer bicycles)*
Possible Suggested Improvements

• Stripe wider bike lanes (7-8 feet) where there is space to do so - existing travel lanes are 20 feet wide.

• Restripe existing streets with minimum width bike lanes to provide 7-foot bike lanes where travel lanes are wider than 12 feet.

• Stripe buffered bike lanes on street where travel lanes are much wider than 12 feet, for example all roads built to a 6-lane section but currently striped as 4-lane roads.
Stripe bike lane on freeway overpass
Residential street used by bicyclists
Possible Suggested Improvements

• Stripe “Sharrow” markings eleven feet from the curb and at 250 foot

• Create a Bike Boulevard by providing appropriate striping and signing and traffic calming

• Convert existing multi-way stop controlled intersections into mini roundabouts to provide traffic calming without require drivers to come to complete stop

• Mini roundabouts could also be implemented at intersections that do not meet warrants for an all-way stop.
Why are Schools Frequently Field Audit Sites?
Schools Present Special Challenges
City of Moreno Valley Pedestrian Safety Assessment
Walking Audit Site Number 2: Alessandro Blvd - Heacock St to Perris Blvd.
Section 2 of 2.
Possible Suggested Improvements

- Restripe the markings for the crosswalk
- Stripe white lines with the legend “Wait Here” two feet back from the curb on the approaches to the crosswalk.
- Convert all the parking spaces adjacent to the school property to loading zones
- Install pedestrian railing on the east side of road behind the curb of the northbound approach from the crosswalk for a distance of 200 feet to guide pedestrians to crosswalk
Participants - what could be done better here?
What About Railroad Crossings?
Better placement of gates would also protect peds and bikes.
Are RR gates protecting pedestrians as well vehicles?
Bike path approaching RR Xing in Quiet Zone

Solar panels!
Train blocks crossing for more than 30 minutes causing pedestrians/bicyclists to crawl under the train.
Where Does Law Enforcement Apply?
“Rat Box” for Enforcing Red Indications
High Tech Speed Enforcement

Time and distance values seen on rear LCD

71 MPH
0.77 S
78.2 F
Tribal Transportation Safety Assessments Project
• Casinos are major generators of all road users

• Rural roads with many single vehicle collisions

• Collision data very difficult to find

• Some of field audits have to rely on forensic evidence at problem locations such as crosses and skid marks
Substandard Roadway on Native American Land
(Used by pedestrians to access casinos)
Substandard Pedestrian Crossings Under I 10
(Drainage culvert used)
Access to Gaming Facilities Problematic
(People dash across Interstate 10)
Final Report

Report Sections
➢ Executive Summary
➢ Introduction to Assessment
➢ Project Background
➢ Identification of Study Locations
➢ Identification of Countermeasures
➢ Results of Benchmarking Survey
➢ Matrix of Safety Toolbox
➢ List of Resources
### 3.0 BICYCLE COLLISION COUNTERMEASURES

#### Update Traffic Control Devices

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Benefits</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Except Bicycles placard</td>
<td>Regulatory sign for use with other regulatory signs.</td>
<td>Increases or maintains the access and circulation capabilities of cyclists.</td>
<td>Used at locations where the indicated restriction does not apply to cyclists, such as No Left Turn or Do Not Enter.</td>
</tr>
<tr>
<td>Sharrow</td>
<td>Pavement marking that indicates the location within the travel lane those cyclists are expected to occupy.</td>
<td>Encourages cyclists to ride outside of the door zone. Studies have shown that sharrows reduce the incidence of cyclists riding on the sidewalk and toward oncoming traffic.</td>
<td>City streets with two or more lanes, where the rightmost lane is too narrow for a motor vehicle to safely pass a cyclist within the travel lane.</td>
</tr>
<tr>
<td>Bike Lanes May Use Full Lane sign</td>
<td>Regulatory sign (MUTCD R4-11).</td>
<td>Indicates that cyclists can travel in the center of a narrow lane.</td>
<td>City streets with two or more lanes, where the rightmost lane is too narrow for a motor vehicle to safely pass a cyclist within the travel lane.</td>
</tr>
<tr>
<td>Share the Road sign</td>
<td>Warning sign and placard</td>
<td>Informs motorists to expect cyclists on the roadway.</td>
<td>Two-lane roads, particularly in rural areas, where shoulders are less than 4 feet.</td>
</tr>
<tr>
<td>Bike Directional sign</td>
<td>Informational sign indicating place names and directional arrows, with distances as a recommended option (MUTCD D1-2C).</td>
<td>Informs cyclists of the most common destinations served by the bike route.</td>
<td>Particularly useful to direct cyclists to a facility, such as a bike bridge or a bicycle-friendly street, to access a major destination that might not be easily apparent.</td>
</tr>
<tr>
<td>Ride with Traffic and Wrong Way Signs</td>
<td>Install signs from part 9 of the CAMUTCD encouraging bicyclists to ride with traffic and not against traffic.</td>
<td>Corrects the leading cause of bicycle collisions on along the heavily traveled corridors of many major cities.</td>
<td>Along heavily traveled corridors of most major cities.</td>
</tr>
</tbody>
</table>
Tech Transfer Contacts

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