Traffic Engineering for Sustainable Communities

“A New Way of Doing Business”

Rail~Volution

October 19, 2010

Jim Daisa, P.E.
Kimley-Horn and Associates
Communities Want Streets That:

- Compatible with adjacent uses
- Support economic development
- Are safe and attractive for all users
- Focus less on autos and speed
- Are quality public spaces
- Allow flexibility in engineering
- Require fewer design exceptions
Sponsors

- Federal Highway Administration
- Environmental Protection Agency

- A joint effort:
  - Institute of Transportation Engineers
  - Congress for the New Urbanism
What CSS is:

- Sharing in decisions
- Balancing travel and other needs
- Embracing community values
- Innovative, higher level design
- Benefiting all users
- Sustained and participatory
- Supportive partnerships
- Commitment

Photo: Dan Burden, Walklive.org
Challenges

- Safety
- Cost
- Environmental Quality
- Accessibility
- Natural & Human Environment
- Capacity
- Historical and Scenic Characteristics
- Multimodal Considerations
- Physical Character

Project Design

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
Avoiding the D.A.D. Syndrome

This

Listen ➔ Design ➔ Build

Not this

Decide ➔ Design ➔ Defend ➔ Re-Design ➔ Delay

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
CSS: A Way of Doing Business

- Open to organizational change required for successful CSS
  - Change in thinking
  - Change in roles and responsibilities
  - Change in work processes (the project development process)

- Acceptance, embracing cultural change is critical

- Top down initiative

“Model culture is customer focused, environmental stewards, and efficient providers of transportation services”

CSS: Bringing Place and Thoroughfare Design Together

E14th Corridor - San Leandro, CA Source: Community, Design + Architecture and Urban Advantage
CSS: Bringing Place and Thoroughfare Design Together

E14th Corridor - San Leandro, CA Source: Community, Design + Architecture and Urban Advantage
CSS: Bringing Place and Thoroughfare Design Together

E14th Corridor - San Leandro, CA Source: Community, Design + Architecture and Urban Advantage
CSS Design Framework

- **Context zones:**
  - Suburbs to urban cores

- **Street classification:**
  - Functional class
    - Arterial
    - collector
  - Thoroughfare type
    - Boulevard
    - Avenue
    - Street

- **Compatibility & mutual support**
Walkable Places

- Accommodates all users
- Compact and mixed-use
- Mix of residential and commercial densities
- Multimodal network connectivity
- Pedestrian-scaled buildings, landscape and streets
- Thoroughfares serve activities of adjacent uses

Photo: Kimley-Horn and Associates, Inc.
Context Zones – An Organizing System for Thoroughfare Design

Source: Duany Plater-Zyberk and Company
# CSS vs. Conventional Thoroughfare Design Approach

<table>
<thead>
<tr>
<th>Conventional</th>
<th>CSS Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context:</strong></td>
<td><strong>Context:</strong></td>
</tr>
<tr>
<td>Urban</td>
<td>Suburban</td>
</tr>
<tr>
<td>Rural</td>
<td>General urban</td>
</tr>
<tr>
<td></td>
<td>Urban center</td>
</tr>
<tr>
<td></td>
<td>Urban core</td>
</tr>
<tr>
<td>Design criteria primarily based on:</td>
<td>Design criteria primarily based on:</td>
</tr>
<tr>
<td>Functional class</td>
<td>Community objectives</td>
</tr>
<tr>
<td>Design speed</td>
<td>Functional class</td>
</tr>
<tr>
<td>Forecast travel demand</td>
<td>Thoroughfare type</td>
</tr>
<tr>
<td>Level of service</td>
<td>Adjacent land use</td>
</tr>
</tbody>
</table>

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
Features That Create Context

- **Land use**
  - Defines urban activity
  - Major factor in design criteria

- **Site design**
  - Arrangement of buildings, circulation, parking and landscape
  - Vehicle or pedestrian-orientation

- **Building design**
  - Height, massing shape context
  - Create enclosure/pedestrian interest

Photo: Community, Design + Architecture
Thoroughfare Design Changes as Context Changes

The thoroughfare both responds to and contributes to shaping the context and defining the place.
Place in Transition

Simulation by Urban Advantage

10 Years

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
Place in Transition
Thoroughfare Types

• **Three classifications:**
  – Boulevard
  – Avenue
  – Street

• **Basis for:**
  – Physical configuration
  – Design criteria

Photo: Kimley-Horn and Associates, Inc.
Boulevard
Boulevard

- Divided arterial (4+ lanes)
- Target speed (35 mph or less)
- Through and local traffic
- Serve longer trips
- Access management
- Major transit corridor
- Primary freight route
- Emergency response route
- May or may not have curb parking

Photo: Dan Burden, Walklive.org
Multi-way Boulevard
Walkable high capacity street

- Central roadway for through traffic
- Parallel access lanes
- Access lanes for parking, and pedestrian and bicycle facilities
- Require significant right-of-way
- Special treatment of intersections

Avenue
Avenue

- Arterial or collector (4 lanes max)
- Target speed (30 to 35 mph)
- Land access
- Primary ped and bike route
- Local transit route
- Freight - local deliveries
- Optional raised landscaped median
- Curb parking
Street
Street

- Collector or local
- 2 lanes maximum
- Target speed (25mph)
- Land access
- Designed to connect
- May be commercial main street
- Emphasizes curb parking
- Freight restricted to local deliveries

Photo: Kimley-Horn and Associates, Inc.
Speed/Accident Severity Relationship

- Speed Reaction: 148'
- Perception: 110'
- Total Stopping Distance: 196' 313'

- 40 mph: Fatal
- 30 mph: Serious
- 20 mph: Injury

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
Design Factors that Influence Target Speed (Urban Areas)

- Lane width
- Minimal offset
- No superelevation
- No shoulders
- On-street parking
- Smaller curb return radii
- Design of right turn lanes
- Spacing of signalized intersections
- Synchronization to desired speed
- Paving materials
Flexibility in Design

“Balancing street improvements with need to safely integrate the design into the surrounding natural and built environments”

- Consider **ALL** users
- Use existing flexibility
- Prepare to reevaluate decisions
- Understand the exception process
- Don’t fear unique solutions
- Document rationales
Streetside

- Zones:
  - Edge
  - Furnishings
  - Throughway (ADA)
  - Frontage

- Function and dimensions vary by context zone and adjacent land use
Streetside Design Considerations

• Zone width and function
• ADA requirements
• Pedestrian buffers
• Sidewalk/driveway/alley crossings
• Street furniture
• Transit stops
• Above and underground utilities
• Landscaping/street trees
• Public places
• Public art

Photo: Kimley-Horn and Associates, Inc.
Traveled Way Design

- Access management
- Stormwater management
- Lane width
- Medians
- Bicycle facilities
- On-street parking
- Mid-block crosswalks
- Pedestrian refuge islands
- Bus stops
- Dedicated transit lanes
- Snow removal or storage

Photo: Kimley-Horn and Associates, Inc.
Lane Width

- Recommended practice
  - Range of lane widths:
    - 10 to 12 feet on arterials
    - 10 to 11 feet on collectors

- RP describes how width is influenced by:
  - Design speed
  - Design vehicle
  - Right-of-way
  - Width of adjacent parking and bicycle lanes
Transit Design

- Effects on Thoroughfare Design:
  - Local Bus
  - Rapid Transit
  - Bus Rapid Transit
  - Light Rail Transit
  - Bus Stops
  - Stations
Intersection Design Considerations

- Sight distance
- Pedestrian crossing time
- Bicycle clearance intervals
- Operations and level of service
- Curb return radii
- Accessibility
- Channelized right turns
- Crosswalks
- Curb extensions
- Bicycle lane treatment
- Bus stops at intersections
- Queue jump lanes
- Modern roundabouts
### Example

#### Pedestrian and Bicycle Features at Signalized Intersections

| Shorter and more visible crosswalks | • Crosswalks on all approaches  
• Longitudinal markings  
• Reduced overall street widths by reducing the number of travel and turn lanes, or narrowing travel lanes  
• Curb extensions with pedestrian push buttons on extensions; and  
• Median refuges on wide streets (greater than 60 feet) with median push buttons |

| Priority for pedestrians, bicyclists, and accessibility | • Shorter cycle lengths, meeting minimum pedestrian clearances  
• Longer pedestrian clearance times (based on 3.5 ft/sec. to set flashing (clearance) time and 3.0 ft/sec for total crossing time)  
• Reduced conflicts between pedestrians and turning vehicles achieved with  
  • Pedestrian lead phases  
  • Scramble phases in very high pedestrian volume locations;  
  • Restricted right turns on red when pedestrians are present during specified hours  
  • Allowing right turns during cross-street left turn phases reduces the number of right turn conflicts during pedestrian crossing phase |
Pedestrian Features at Uncontrolled Intersections

- Median refuge island
- High visibility crosswalk markings
- Advanced warning signs
- Street and crosswalk illumination
- Advanced yield lines
- Curb extensions
- Pedestrian activated flashing beacons
- Consistently applied within pedestrian-oriented corridors

Illustration: BMS Design Group
Guidance for State Highways

Grand Boulevard Initiative

Multimodal Access Strategy & Context-Sensitive Design Guidelines

Preparing by:
C/CAG • SAMTRANS • VTA • CALTRANS
with assistance from:
Bottomley Associates Urban Design & City Planning
Kimley-Horn Associates, Inc.
Nevue Ngan Associates

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
2.5 Corner Curb Bulb-Outs

Design Issues: Long street crossings can deter pedestrian circulation, as noted under 2.5, above. In many locations the visibility of pedestrians at crosswalks is reduced by traffic and parked cars. Storm drainage inlets at street corners are often located within pedestrian crosswalk areas.

Recommendation: Corner curb bulb-outs should be installed at all pedestrian crossings as local conditions allow, consistent with Guideline II.1. A minimum 4-foot clearance is required between the bulb-out and the outside edge of the adjacent travel lane. Corner curb radii should be the minimum needed to accommodate vehicle turning movements given the local context; i.e., a radius of 15 feet is recommended in Node areas that have substantial levels of existing or planned pedestrian and/or transit transfer activity. Curb radii may be increased to 25 to 30 feet to accommodate regular and frequent turning large vehicles such as a bus. Curb radii in node areas should be as small as practical to reduce pedestrian crossing distance and reduce the speed of turning vehicles. Infrequent turning large vehicles should be allowed to encroach into opposing lanes on narrow side streets.

In general, the flat side of a bulb-out should be 20 to 30 feet in length along SR 82, allowing generous space for pedestrians as well as directional signs, pedestrian-oriented lighting, street furnishings and other amenities. Longer bulb-outs are recommended for bus stops consistent with local transit agency requirements. Shorter bulb-outs may appropriate in storefront commercial areas to conserve on-street parking.

Bulb-outs provide an opportunity to relocate storm inlets out of crosswalk areas, and to reduce crosswalk slopes to the 5% maximum required by ADA. However, the new drainage inlets and grading that can be associated with construction of bulb-outs can be costly. Where they exist, traffic signals typically need to be relocated as well. Consistent with Guideline II.2, refuge islands are recommended as the first priority crossing improvement, followed by corner bulb-outs and other crossing improvements as described above.

Caltrans Matrix Reference: There are no State Highway standards for bulb-outs; see Matrix section U.

2.5.a - Short Bulb-Out (Adjacent to Storefront Commercial Curbside Parking)

2.5.b - Typical Bulb-Out

2.5.c - Bus Bulb-Out
6.2. Grade-Separated Bike Way

**Design Issue:** In some communities, grade-separated (Class I) bikeways may be desired to encourage bicycle use and minimize conflicts with autos and other vehicles. Frontage space is constrained, however, and accommodating transitions between at-grade and grade-separated bikeways can be a challenge.

**Recommendation:** Grade-separated bikeways can be a valuable element in a multi-modal transportation strategy. However, they would be difficult to implement over large portions of the SR 82 corridor given the land area and associated parcel assembly required. Special intersection design approaches would be needed to accommodate the transition between off-street and on-street bikeway conditions. Re-development of large shopping center sites, office complexes, and government or institution-owned properties are potential candidates.

Image 6.2 depicts a grade-separated bikeway along a Link area residential and mixed-use frontage; a dismount area adjacent to an intersection is shown in the foreground. A similar approach is employed in the City of Davis and other locations in the US and around the world.

**Caltrans Matrix Reference:** Not applicable for bikeways located outside the right-of-way. Caltrans review of plant materials required; see Matrix section K.
6-Lane Link Improvements - Design Exceptions 1 (Reduced Crossing Distance)

- Reduce exposed pedestrian crossing distance
- Increase street trees
- Accommodate bike travel

Caltrans Design Exception
Tree in median closer to stop bar than 100' subject to sight distance study

Caltrans Design Exception
Left turn lane 10' rather than 12', with 6' refuge, allows for 16' median

Exposed Pedestrian Crossing Distance 38'
Curb to Curb 104' +/-"
TOWN CENTER

Figure 3.12: Town Center Proposed Roadway Configuration

- BUS STOP
- LEFT TURN POCKET
- FOUR TRAVEL LANE
- PLANTED MEDIAN
- PARALLEL PARKING
- BULB-OUT
- IMPROVED PEDESTRIAN CROSSING
- BRT STATION
Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
Pedestrian-Oriented Corridors

The Alameda (State Route 82) “The Beautiful Way” San Jose, CA Illustration: BMS Design Group
Questions?