Project Background

- Produced by FHWA/EPA/CNU/ITE
- Recommended Practice, focus on new ideas and needs
Limitations

• 2010 vs. 2017 → Differences in understanding CSS and Complete Streets
• Some difficulty adapting recommended practices to local contexts
• RP focus on design, less so on policy and process
• Lack of strong guidance for suburban-type areas
This Publication

• Implementing Context Sensitive Design on Multimodal Corridors: A Practitioner’s Handbook

• Produced by FHWA/ITE

• Informational Report, focus on adapting to new information and audiences

@CompleteStreets Implementing Context Sensitive Design
Project Goals

• User-friendly, graphically-rich application guide
• Expand and enhance the content of the ITE RP and the NACTO Guide through case studies
• Demonstrate successful practical applications
• Solutions with multimodal focus (ped, bike, freight)
Content Development and Review

- Technical Editor: Nelson\Nygaard
- Case Studies: CNU
- FHWA Office of Planning, Environment, Realty
- 30+ Subject Matter Experts
- AASHTO
- AMPO
- ITE Complete Streets Council
- ABPB
- US Access Board
- Smart Growth America
- Independent Truckers (OOIDA)
- Development and Land Use (NADO)
- Freight & Research Communities

@CompleteStreets Implementing Context Sensitive Design
Reception and Feedback

• Launch webinar in November 2017
• FHWA dissemination and promotion
• Over 700 copies downloaded since launch
• Positive feedback, innovation with “mature” case studies
Managing Transition
A Practitioner’s Guide to Multimodal Thoroughfare Design

@CompleteStreets
Why Another Guide?
Strong, Clear Urban Guidance
Other Contexts Are Harder To Discern

Things The Green Book Says:

• Provisions should be made, because **pedestrians are the lifeblood** of our urban areas.

• There are **important differences between** the design criteria applicable to **low- and high-speed** designs.

• Use simple designs that **minimize crossing widths** and minimize the use of more complex elements such as channelization and separate turning lanes.

• On lower speed facilities, **use of above-minimum design criteria may encourage travel at speeds higher** than the design speed.
Our Communities Don’t Fit a Mold

53% of Americans describe where they live as suburban

URBAN/SUBURBAN DESIGNATIONS, BY CITY

- New York: 100% Urban, 0% Suburban
- Chicago: 100% Urban, 0% Suburban
- Philadelphia: 97% Urban, 3% Suburban
- Los Angeles: 87% Urban, 13% Suburban
- San Jose: 67% Urban, 33% Suburban
- Houston: 63% Urban, 37% Suburban
- Dallas: 60% Urban, 40% Suburban
- San Diego: 49% Urban, 51% Suburban
- San Antonio: 35% Urban, 65% Suburban
- Phoenix: 30% Urban, 70% Suburban

Implementing Context Sensitive Design
Places Are Not Static
Design Process

1. Define Problem
2. Document Physical and Policy Context
3. Identify Process and Stakeholders
4. Analyze Collaboratively
5. Manage Communication
Design Process

1. Define Problem
2. Document Physical and Policy Context
3. Identify Process and Stakeholders
4. Analyze Collaboratively
5. Manage Communication
Part 1 - Pre-Design: Defining The Problem
Pounds of CO2 Per Person-Mile

- Walking and Biking: 0
- Transit Passenger (all seats full): 0.12
- Transit Passenger (average occupancy): 0.52
- Vehicle Trip (one person): 0.96
Annual Transportation Cost by Mode

<table>
<thead>
<tr>
<th>Transportation Mode</th>
<th>Dollars per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td>$300</td>
</tr>
<tr>
<td>Bus</td>
<td>$1,200</td>
</tr>
<tr>
<td>Car</td>
<td>$8,558</td>
</tr>
</tbody>
</table>
California's DOT Admits That More Roads Mean More Traffic

Take it from Caltrans: If you build highways, drivers will come.

ERIC JAFFE | @e_jaffe | Nov 11, 2015 | 331 Comments
Results Over the Last 50 Years

1. Vehicle Miles of Travel (VMT) Growing Faster Than Population Growth
2. Longer Commute Times
3. Decreased Transit Ridership
Public Health Impacts

- Cardiovascular: Heart Attack, Stroke
- Respiratory: Asthma, Emphysema
- Weight Related: Diabetes II, Heart Disease
- Environmental: Cancer & other "chronic" diseases
Pre-Design Decisions That Affect Outcomes

1. Traffic Growth Rate – Be Realistic…Don’t Preclude Success
Measure, Don’t Just Project Traffic

West Peachtree Street (south of 6th Street)

West Peachtree Street (south of 16th Street)

Peachtree Street (south of 12th Street)

14th Street (east of West Peachtree Street)
Pre-Design Decisions That Affect Outcomes

1. Traffic Growth Rate – Be Realistic...Don’t Preclude Success
2. Planning Horizon – Select Thoughtfully
Pre-Design Decisions That Affect Outcomes

[Graph showing simple interest and compound interest growth over time.]
Pre-Design Decisions That Affect Outcomes

1. **Traffic Growth Rate** – Be Realistic…Don’t Preclude Success
2. **Planning Horizon** – Select Thoughtfully
3. **“Success” Metrics** – Know Your Market
   1. Level of Service vs. Travel Time
   2. Auto-Only vs. Multi-Modal
   3. Traditional Analysis vs. Broadly-Focused
Level of Service A

San Francisco, CA
Level of Service F

San Francisco, CA
Strategy 1: Observation Studies

Tracking Survey
Sept. 14, 2010 6:30-7:30AM

Walgreen

1

5

10

School Bus Stop

Public Bus Stop

Bus Stop

Bus Stops

105 ft

Newark, NJ

Southeast Hanover Boulevard

CompleteStreets
Implementing Context Sensitive Design
Strategy 2: Safety Analyses (Vision Zero)
Strategy 3: Future-Proofing

• Plan For Horizon Demographics
Baby Boomers

Projected Growth in Population Age 65 and Older by State, 2010–2020 (Percent)

Source: Brookings Institute analysis of 2010 Census Bureau population projections.
Licensed Drivers by Age Group

Strategy 3: Future-Proofing

• Plan For Horizon Demographics
• Be Realistic About Funding
Funding
Strategy 3: Future-Proofing

• Plan For Horizon Demographics
• Be Realistic About Funding
• Build In Autonomy Triggers
Driverless Cars
The Shift In Mobility

@CompleteStreets    Implementing Context Sensitive Design
Transportation Management Platforms

LUUM
RIDE
AMIGOS

@CompleteStreets  Implementing Context Sensitive Design
New Mobility Is About Curb Management
Part 2 - Modes and Networks – The Physical and Policy Context
Tradeoffs

10 Gallons

5 Gallons

Trade Offs
<table>
<thead>
<tr>
<th></th>
<th>Needs</th>
<th>Wants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cars</td>
<td>Capacity</td>
<td>Speed</td>
</tr>
<tr>
<td>Peds</td>
<td>Safety</td>
<td>Comfort</td>
</tr>
<tr>
<td>Transit</td>
<td>Frequency</td>
<td>Reliability</td>
</tr>
<tr>
<td>Bikes</td>
<td>Space</td>
<td>Separation</td>
</tr>
</tbody>
</table>
## Street Users

<table>
<thead>
<tr>
<th>Needs</th>
<th>Wants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cars</td>
<td>Capacity</td>
</tr>
<tr>
<td>Peds</td>
<td>Safety</td>
</tr>
<tr>
<td>Transit</td>
<td>Frequency</td>
</tr>
<tr>
<td>Bikes</td>
<td>Space</td>
</tr>
</tbody>
</table>

@CompleteStreets   Implementing Context Sensitive Design
Primary Tradeoff Drivers

1. Mobility Function
2. Modal Emphasis
3. Context
Tradeoff Tools: Zones
Tradeoff Tools: Function-Driven Zones

Function and Modal Emphasis

@CompleteStreets Implementing Context Sensitive Design
Tradeoff Tools: Context-Driven Zones
1. Mobility Function
1. Mobility Function

@CompleteStreets
Implementing Context Sensitive Design

Atlanta, GA
2. Modal Emphasis
Successful Transit Must Be

1. Convenient
Successful Transit Must Be

1. Convenient
2. Safe & Comfortable
Successful Transit Must Be

1. Convenient
2. Safe & Comfortable
3. Reliable
Context (Urban Form) Matters

Walk Bike Transit

Automobile
“First/Last Mile” Options Are Often Poor

@CompleteStreets  Implementing Context Sensitive Design
Will People Ride Bikes?
Cyclists Are Not Monolithic
Bike Travelers

- Who is the market?

60% Non-vehicular bicyclists that prefer complete separation from motor vehicle traffic, or routes with very low traffic volumes and speeds

7% Confident bicyclists that feel comfortable riding in traffic when they need to, but prefer dedicated bikeways

1% Fearless vehicular bicyclists that feel comfortable riding on streets with or without dedicated bikeways

33% No Way, No How
Not interested in biking

Portland Department of Transportation
Bike Travelers

• Who is the market?

60% Non-vehicular bicyclists that prefer complete separation from motor vehicle traffic, or routes with very low traffic volumes and speeds

7% Confident bicyclists that feel comfortable riding in traffic when they need to, but prefer dedicated bikeways

33% No Way. No How. Not interested in biking

1% Fearless vehicular bicyclists that feel comfortable riding on streets with or without dedicated bikeways

Portland Department of Transportation
3. Identifying Context
Substantially with increasing flow rate.

- For two-lane highways, speed decreases linearly with increasing flow rate over the entire range of flow rates between zero and capacity.

**Design Speed**

Design speed is a selected speed used to determine the various geometric design features of the roadway. The assumed design speed should be a logical one with respect to the topography, anticipated operating speed, the adjacent land use, and the functional classification of highway. Except for local streets where speed controls are frequently included intentionally, every effort should be made to use as high a design speed as practical to attain a desired degree of safety, mobility, and efficiency within the constraints of environmental quality, economics, aesthetics, and social or political impacts. Once the design speed is selected, all of the pertinent highway features should be related to it to obtain a balanced design. Above-minimum design values should
Complete Streets
Implementing Context Sensitive Design
Context May Not Be Temporally Constant
Context May Not Be Temporarily Constant

San Diego, CA
Implementing Context Sensitive Design
Network Strategy 1: Break Down The Blocks

**THIS**

Many routes from A to B: a pedestrian/cyclist amenity in being able to choose less busy, less threatening roads

**NOT THIS**

Only two routes from A to B: pedestrians and cyclists must use roads with heavier traffic
Network Strategy 1: Break Down The Blocks

Same Total Lanes

More Capacity
Relationship Between Unimpeded Block Length and Speed

- High Volume, Entry/Collector St.
- Low Volume, Residential St.
Network Strategy 2: Look For Efficiency

CompleteStreets
Implementing Context Sensitive Design
Strategy 3: Use The Network

@CompleteStreets Implementing Context Sensitive Design
Abercorn Street - Historic District

10.4 Miles of Streets

40,000 Sq.Ft per Acre Density

@CompleteStreets  Implementing Context Sensitive Design
Abercorn Street: Suburban Pattern

4.3 Miles of Streets

15,500 Sq.Ft per Acre Built Density

@CompleteStreets Implementing Context Sensitive Design
Abercorn Street: Retail Mall District

3.3 Miles of Streets

13,500 Sq. Ft. per Acre built Density

@CompleteStreets  Implementing Context Sensitive Design
Part 3 - Safety and Walkability: Process and Tools
Stakeholders and Outreach
Speed Matters – (See Next Section)
How much safer are livable streets?

- Per vehicle mile traveled:
  - 40% fewer midblock crashes than roadway averages.
  - 67% fewer roadside crashes than roadway averages.

- Examined lengths of arterials in 3 small metro regions:
- Substantial design variation:
  - Pedestrian-oriented “livable” streetscape in downtown core.
  - Conventional suburban.
  - Suburban/rural transition.

Source: Eric Dumbaugh, Texas A&M
Common Situations

The Transit “Arterial”

The “Escape Route”
Scale Myth: Some Streets Only Feel Big
Scale Myth: Some Streets Only Feel Big

- Crossing Opportunity
- Isolation
- Proportion & Scale
Vertical Enclosure
Activity (Driven By Density)

Implementing Context Sensitive Design
Crossing Toolkit 1: Safety Standards

Guidelines for Crosswalk Installation on Streets with Speed Limit of 30mph or Below

- Candidate site for marked crosswalks
- Probable candidate site for marked crosswalks
- Marked crosswalks alone are insufficient

Two Lane Road

Three Lane Road

Four or more Lane Road with a Raised Median

Four or more Lane Road

Average Daily Traffic (in thousands)
Pedestrian Crossings
Crossing Toolkit 2: Policies and Priorities

Set Spacing Standard

Should be well under 1000’ in any walkable context

Prioritize Locations

Speed Limits Above 30mph

Generator Component
- Transit Stops (Boarding Thresholds?)
- Jobs Centers (Density Definition?)
- Schools

Risk Component
- Spacing (Tied to Typology?)
- Speed
- Width

Risk Score
Generator Score
Crossing Toolkit 3: Warrants

From MUTCD:

• They (traffic signals) are used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross.

Pedestrian Warrant
• The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.
• The criterion for the pedestrian volume crossing the major street may be reduced as much as 50 percent if the 15th-percentile crossing speed of pedestrians is less than 3.5 feet per second.
• School Warrant and Progression Warrant

Pedestrian Hybrid Beacon
• A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants.
Crossing Toolkit 4: Legibility
Speed Management: Process and Tools
Myth: Freeways Are Efficient
Reality: Good At Certain Things
“Metro areas that invested heavily in road capacity expansion fared no better in easing congestion than metro areas that did not. Trends in congestion show that areas that exhibited greater growth in lane capacity spent roughly $22 billion more on road construction than those that didn’t, yet ended up with slightly higher congestion costs per person, wasted fuel, and travel delay.”

–Surface Transportation Policy Project
Speed Myth: Speed vs. Capacity

The graph illustrates the relationship between speed and hourly vehicles per lane. The blue line shows the speed in miles per hour (Mph) as the hourly vehicles per lane increase. The green line represents the maximum volume, which is 25-30 miles per hour. The graph indicates that as the hourly vehicles per lane increase, the speed decreases, reaching a maximum volume of 25-30 miles per hour.
Implementing Context Sensitive Design
Space Myth: The Cars in MY City Are Huge!

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Height (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prius</td>
<td>5.8</td>
</tr>
<tr>
<td>Pickup</td>
<td>6.6</td>
</tr>
<tr>
<td>Bus</td>
<td>8-9</td>
</tr>
<tr>
<td>Ladder Truck</td>
<td>7-8</td>
</tr>
</tbody>
</table>

Stabilizers: 12-16’
Implementing Context Sensitive Design
What Makes Drivers Slow Down?
Design Speed vs. Operating Speed

• Selection of design speed controls:
  • Horizontal curvature
  • Vertical curvature
Speed Selection

Design Engineers: Design Speed (60 mph) - 5
Speed Selection

Design Engineers: Design Speed (60 mph) - 5

Design Speed (100 mph) - 5
Risk vs. Reward

• Risk:
  • Design of street/street type
  • Weather
  • Presence of pedestrians/cyclists
  • Vertical elements (trees, buildings, etc.)
Risk vs. Reward

• Risk:
  • Design of street/street type
  • Weather
  • Presence of pedestrians/cyclists
  • Vertical elements (trees, buildings, etc.)

• Reward:
  • Decreased travel time
Design Speed vs. Operating Speed

- Selection of design speed controls:
  - Horizontal curvature
  - Vertical curvature

- Design elements that affect operating speed:
  - Multilane Cartways
  - Lane width
  - Edge activity
  - Vertical elements
Strategy 1: Road Diets

Opposing Vehicles In Blind Spots

@CompleteStreets - Implementing Context Sensitive Design
Complete Streets: Implementing Context Sensitive Design
Edgewater Drive (Orlando, FL)
Edgewater Drive (Orlando, FL)

Before

12.6
1 crash every 2.5 days
(146 per yr)

After

34% Reduction
8.4
1 crash every 4.2 days
(87 per yr)
Edgewater Drive (Orlando, FL)

3.6

68% Reduction

Before

1 injury every 9 days
(41 per yr)

After

1 injury every 30 days
(12 per yr)
Edgewater Drive (Orlando, FL)

Percent of Vehicles Traveling over 36 MPH

- North End:
  - Before: 15.7%
  - After: 7.5%

- Middle:
  - Before: 9.8%
  - After: 8.9%

- South End:
  - Before: 29.5%
  - After: 19.6%
## Areas of Successful Road Diet Implementation - Collision

<table>
<thead>
<tr>
<th>Location</th>
<th>Street</th>
<th>Change</th>
<th>Collision Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seattle, WA</td>
<td>8th Avenue, NW, in Ballard Area</td>
<td>4 Lanes to 3</td>
<td>18 to 7 61%</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>24th Avenue, NW, From NW 85th St. to NW 65th Street</td>
<td>4 Lanes to 3</td>
<td>14 to 10 28%</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>Dexter Avenue, N, East side of Queen</td>
<td>4 Lanes to 3</td>
<td>19 to 16 59%</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>Greenwood Avenue</td>
<td>4 Lanes to 3</td>
<td>24 to 10 58%</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>North 45th Street</td>
<td>4 Lanes to 3</td>
<td>45 to 23 49%</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>Martin Luther King Jr. Way, North of I-90</td>
<td>4 Lanes to 3</td>
<td>15 to 6 60%</td>
</tr>
</tbody>
</table>
Minneapolis Lane Removals
Strategy 2: Lane Width Adjustment

Plan

Knox St, Dallas (Demonstration Project)
Lane Widths and Speed

Knox St, Dallas (Demonstration Project)
Strategies 1 and 2

The bike lanes may only be incidental, but you still get them.
Strategy 3: Amenitize The Space Saved
Pittsburgh Street Design Guidelines

Implementing Context Sensitive Design
THANK YOU
Paul Moore
Nelson\Nygaard
213.785.5500