Bicycle and Pedestrian Facilities
Complete Streets
Colorado Legal Context

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Planning for Healthy Communities
Class 9
Bicycle and Pedestrian Facilities

- Potential to have the most profound impact at the least cost in reducing VMT, reducing GHG and enhancing public health. *Period.*
Pedestrian & Cyclist Safety

- FHWA: 4,461 pedestrians and 725 cyclists killed in 2004
- 13 percent of all traffic fatalities
- Elderly particularly vulnerable
Pedestrian & Cyclist Safety

- The powerful radius standard
- Influence of wide streets on traffic behavior
- Vigilante traffic calming
Bicycle & Pedestrian Planning in the USA

- Per SAFTEA-LU (Safe, Accountable, Flexible Transportation Equity Act—Legacy for Users) States and MPOs are required to incorporate appropriate provisions for bicycling and walking into the STIP and TIPs.
- States are required to establish a Bicycle and Pedestrian Coordinator position in its State Department of Transportation.
- Federal Bicycle Commuter Bill: Employer tax break of $20/month.
- Governor Ritter’s Blue Ribbon Commission policy recommendation to enhance nonmotorized safety and bicycle and pedestrian improvements.
The 4 E’s:

- Encouragement
- Enforcement
- Engineering
- Evaluation
- FHA comprehensive university course on bicycle and pedestrian transportation
AASHTO skill levels

- Type A (Advanced).
- Type B (Basic).
- Type C (Children)
Bicycle Facility Types

- Shared roadway with regular lane width
- Wide curb lane
- Bike lane
- Separated path or lane
Bicycle & Pedestrian Facilities Planning

- Van Hemert’s conceptual framework for considering factors affecting utilitarian cycling
- Dutch standards and systems
  - And some other European examples
- Pedestrian facilities
Factors Affecting Cycling Activity:

- Psychological
- Cultural
- Institutional
- Physical
- Hybrid: Cultural/Institutional/Physical
- Hybrid: Institutional/Physical
Psychological

- Cyclist competence
- Fear of automobiles, traffic
- Urban topography
- Carrying loads
- Climatic conditions
- Physical effort
- Behavioural inertia (Canadian spelling, eh)
Cultural

- Social acceptance
- Demographic character
- Socio-economic character
Hybrid: Institutional/Physical

- **Degree of adequate access**
  - Linear
  - Bridge crossings
  - Public transportation

- **Land use characteristics**
  - Degree of homogeneity/heterogeneity
  - Density

- **Bicycle facilities**
Physical (the least significant factor)

- Physical handicaps
- Natural barriers
- Severe climatic conditions
- Speed of bicycle
Institutional

- Communication
  - Media
  - Advocacy
  - Education
- Formal recognition
- Enforcement
Hybrid: Cultural/Institutional/Physical

- Cycling environment
  - Motorist’s cooperation, pollution, road conditions
- Degree of automobile orientation
- Traffic characteristics
- Relative speed and convenience of available transit choices
- Theft
- Vandalism
- Clothing requirements
- Mugging
Quantifies the "bicycle friendliness" of roadways

The significant variables include:

- the presence and width of a paved shoulder or bicycle lane;
- motor vehicle traffic volume and speed in adjacent lanes;
- the presence of motor vehicle parking;
- and the type of roadside development.
Cycling Environment Illustration: Bicycle LOS

- LOS is an evaluation of bicyclists’ perceived safety and comfort with respect to motor vehicle traffic while traveling in a roadway corridor. It identifies the quality of service for bicyclists or pedestrians that currently exists within the roadway environment.
Equation considers volume, speed, traffic type, road width, road surface quality

**Bicycle LOS categories.**

<table>
<thead>
<tr>
<th>LOS Bicycle LOS Score</th>
<th>Compatibility Level</th>
</tr>
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<tbody>
<tr>
<td>A ≤ 1.5</td>
<td>Extremely High</td>
</tr>
<tr>
<td>B &gt; 5.5</td>
<td>Very High</td>
</tr>
<tr>
<td>C &gt; 4.5 and ≤ 5.5</td>
<td>Moderately High</td>
</tr>
<tr>
<td>D &gt; 3.5 and ≤ 4.5</td>
<td>Moderately Low</td>
</tr>
<tr>
<td>E &gt; 2.5 and ≤ 3.5</td>
<td>Very Low</td>
</tr>
<tr>
<td>F &gt; 1.5 and ≤ 2.5</td>
<td>Extremely Low</td>
</tr>
</tbody>
</table>

Bicycle LOS = \( a_1 \ln(Vol_{15}/L_n) + a_2 SP_t(1+10.38HV)^2 + a_3(1/PR_5)^2 + a_4(W_c)^2 + C \)
Is Denver Bicycle-Friendly?
International Approaches to Bicycle and Pedestrian Facility Design — Federal Highway Administration
 Shared lanes are 4.5 meters (m) (15 feet (ft)) wide.
 Shared lane signing and marking.
Common at transit stations.
Sheltered parking.
Bicycle rentals common at transit stations.
Bicycle Trails and Sidepaths

- Used throughout Europe.
- Some on abandoned rail right-of-way.
- Used more along high-speed roadways.
- More crashes at road intersections
Close in view of the Dutch System
Why pick the Dutch?
Comparison of Dutch and American City Planning Approaches

- USA
- Netherlands
National Framework

- Netherlands
  - Integrated and coordinated by VROM—Ministry of Housing, Spatial Planning and the Environment
  - Ministry of Transportation and Water Management

- USA
  - US Department of Transportation
    - Federal Highways Admin.
    - Federal Transit Admin.
    - Federal Railroad Admin.
  - No land use framework
Strategies

Netherlands
- Land use subordinate to regional and national regulatory framework
- Public/private partnerships
- National bicycle plan
- National rail system
- National highway system

USA
- Local control of land use
- Developer initiation predominates
- High degree of negotiation
- Interstate highway system
- Transportation program funding via SAFETEA-LU
- No effective national rail system
- No bicycle plan
Cultural

- Netherlands
- USA
Geographical

- Netherlands is tiny:
  - 13,000 sq. miles
  - 16.5 million
  - Density: 1,031/sq. mile

- USA is enormous
  - 3,700,000 sq. miles
  - 303 million
  - Density: 86/sq. mile
Figure 1. Bicycle share of trips in Europe, North America, and Australia (Percent of total trips by bicycle)

Sources: Australian Bureau of Statistics (2007); Netherlands Ministry of Transport (2006); Department for Transport (2005); OECD (2005); European Conference of the Ministers of Transport (2004); European Union (2003); U.S. Department of Transportation (2003); German Federal Ministry of Transport (2003)
Figure 4. Bicycling share of short trips in the Netherlands, Denmark, Germany, UK, and USA (2000-2005)

Sources: Danish Ministry of Transport (2007); Netherlands Ministry of Transport (2006); Department for Transport (2005); U.S. Department of Transportation (2003); German Federal Ministry of Transport (2003)
Figure 8. Women’s share of total bike trips in the Netherlands, Denmark, Germany, UK, Australia, and North America (2000 - 2005)

Sources: Australian Bureau of Statistics (2007); Department for Transport (2007); Danish Ministry of Transport (2005); Statistics Netherlands (2005); German Federal Ministry of Transport (2003); U.S. Department of Transportation (2003) and information provided directly by bike planners in Canadian provinces and cities
Figure 9. Bicycling share of trips by age group in the Netherlands, Denmark, Germany, UK and USA (2000-2002)

Sources: Department for Transport (2007); Danish Ministry of Transport (2005); Statistics Netherlands (2005); German Federal Ministry of Transport (2003); U.S. Department of Transportation (2003)
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Figure 10. Fatality rates and non-fatal injury rates in the Netherlands, Denmark, Germany, UK and USA 2004-2005

Sources: Danish Ministry of Transport (2007); Netherlands Ministry of Transport (2007); German Federal Ministry of Transport (2007); U.S. Department of Transportation (2007); Department for Transportation (2007)
Bicycle Planning in the NL

- Multi-faceted, mutually reinforcing set of policies that includes the suppression of the automobile
  - Focus on serving people
  - Keeping the automobile in its place
7 reasons to encourage cycling

1. Low energy: 1500 miles/gallon
2. No noise
3. No air pollution
4. Exercise
5. Fraction of space required
6. Economical
7. Most equitable form of transport
Bicycle Planning in the Netherlands
The Cycling network

- Cohesion
- Directness
- Safety
- Comfort
- Attractiveness
- Bicycle parking
- Information
Cohesion

- Network completeness (250m mesh) built up area
- Centers and important amenities interconnected
- Route completeness outside built up area
- Match with need to travel
Directness
Safety
Avoid conflicts with crossing traffic
Separated vehicle types
Reduce speed at conflict points
Recognizable road categories
Main cycle routes recognizable by their design
Avoid single sided conflicts
Bollards, parked cars
Lighting
Uniform traffic situations
Cycle amenities and intersection solutions related to functions of tracks and roads for bicycle and motorized traffic
Comfort

- Prevent traffic nuisance
- Minimize bike/car encounters
- Unimpeded flow
- Smoothness
- Ease of finding destination
- Comprehensibility
Social safety and control
• Well maintained and visible
Parking

- Dynamic requirements
- Security
- Public and private
U staat hier.
Automobile Suppression

- “Sticks”
  - Tax
  - Fees
- Traffic calming
- Woonerf
Traffic calming
Bicycle Signals—The Netherlands

- Red, yellow, green signal indications for bicyclists.
- Special signal phases for bicyclist turning movements.
Bicycle Lanes—The Netherlands

- Red pavement color.
- Wide enough for two bicyclists.
- Extensive network.
- Marked through intersections
Auto calmed streets—Dutch Woonerf

All mobility modes equal
“Woonerf”
Land Use
Cycling lessons for the USA

- Taming the automobile
- Enhancing facilities
- Enhancing safety
- Social marketing
Selected elements of draft Sustainable Community Development Code

- **Remove obstacles**
  - Restrict new residential > 2 miles from city core
  - Bar car traffic, allow bicycles in city core

- **Create incentives**
  - Public transport bicycle
  - Design cycling routes faster than cars

- **Create standards**
  - Roundabouts with cyclist row
  - Reduction of wait time at traffic lights
  - Free, supervised bicycle storage
  - Car free zones
Making Walking Irresistible

- Most convenient
- Most direct
- Fastest
- Most comfortable
- Safest
- Most interesting
- Promenades
Observations on pedestrian precinct design from Europe
Cobbles
Human powered transport
Places to sit, sleep and play
Beer
Coffee
Tame the car
Flowers and green things
Many doors and windows
Art
Music
Outdoor markets
Basic Urban Sidewalk Requirements

1. adequate width of road travel lanes,
2. a buffer from the travel lane, (5 to 7 feet) min.
3. curbing,
4. minimum width (5 feet for two people)
5. gentle cross-slope (2 percent or less),
6. a buffer to private properties,
7. adequate sight distances around corners and at driveways,
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Ambiance, Shade, and Other Sidewalk Enhancements

- Trees
- Pavers
- Awnings
- Outdoor cafes
- Alleys, narrow streets
- Kiosks
- Public art & play areas
- Pedestrian streets
Complete Streets
Creating Streets for All Users

- Complete Streets are more than Utilities
- Complete Streets benefit adjacent properties
- Complete Streets offer healthy and sustainable travel choices
Streets are meant to Serve
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Colorado legal context

› Health Statute: C.R.S. 25-1-506(h)

› County and district health department powers:

  • To initiate and carry out health programs...deemed necessary or desirable for the protection of public health and the control of disease...”
Characteristics of Complete Streets

- Complete Streets are fundamentally great places for people
- Complete Streets offer a consistent level of design quality
- Complete Streets are defined by their doorways, not the roadway
- Complete Streets enhance the places they serve
- Complete Streets are a form of civic art
Barriers to Complete Streets

- Single agency responsibility
- One size fits all standards
- Auto oriented design focus
- Design for worst 2 hours of the day
- Increasing distances between destinations
- Zoning limitations for mixed use
- Current network design relies on high capacity arterials
Creating Better Streets

- Context Sensitive Solutions
- Network Connectivity
- Traffic Calming
- Updated LOS Policies
- Bicycle/Pedestrian Friendly Design
- Street Network Design
CSS balances traditional transportation concerns with community values to produce a final product which is both safe, effective, and an asset to the surrounding community.

Transportation Issues:
- Safety
- Traffic Operations
- Intersection Capacity
- Level of Service
- Delay
- Growth Accommodation

Community Issues:
- Preservation of scenic areas
- Landscaping & Aesthetics
- Environmental preservation
- Land use compatibility
- Neighborhood Impacts

Roadway Design
Network Connectivity

- Direct travel routes to destinations
- Distributed traffic with less reliance on major streets
- Direct routes allow for cut-through traffic on minor streets
- Simplified pedestrian travel and wayfinding
- Multiple transit routing options
Level Of Service Policies

- Identify and value tradeoffs
- LOS policies for all modes
- Tiered LOS policies

Northeast leg being prepared for widening

Southwest leg widened substantially

The widths of the west and east legs have increased
More Information

- Smart Growth Planning
  - http://www.smartgrowthplanning.org
- Congress for the New Urbanism (CNU)
  - http://www.cnu.org/aboutcnu/streets_initiative.html
- Institute of Transportation Engineers
  - http://www.ite.org/css/
- Context Sensitive Solutions
  - http://www.contextsensitivesolutions.org/
- Traffic Calming
  - www.trafficcalming.org
Colorado legal context

Land Use Statute: C.R.S. 30-28-136 (I)

› Addresses county subdivision process
› Local health agency to review subdivision plans for sewage and water supply quality
› Silent on land use planning (e.g. active living)