New Frontiers in Traffic Engineering

CVEN 457 & 696
Lecture #33
© Gene Hawkins
• Your parents and grandparents
  - *Suburban home (1/4+ acre lot)*
  - *Commute to work*
  - *1 car per driver*
  - *Limited access to public transportation*

• Your generation (not necessarily you)
  - *Live close to work*
  - *Location more important than a yard*
  - *Not dependent upon automobile*
  - *Expect accommodation*
Historically, traffic engineers focused on:
- **Mobility**: moving more vehicles through a corridor
- **Safety**: minimizing potential for vehicular crashes
- **Efficiency**: achieving mobility and safety at lowest costs
  - Doing best with limited resources
- **Decisions reflect demand**
  - Emphasis on cars (greatest demand)

Historically, society focused upon:
- **Convenience**
- **Independence**
- **Suburban living**
- **Automobiles**

Engineers were policy and decision makers
- **Engineering decisions not typically questioned**
Some Urban Advocates

- Promoting new lifestyles
- Buzzwords:
  - *Active Living, Livable Communities, Complete Streets, Livable Urban Places, others*
- See personal vehicles as a societal costs
  - *Create congestion*
  - *Require public resources*
  - *Constrain some businesses*
- View transit, bikes, and walking as preferred modes in the urban landscape
- Leading to changes in how some agencies approach transportation
  - *No longer about maximizing vehicle movement*
New TE Focus

• Consider all modes of travel
  – Cars, trucks, buses, peds, bikes
  – Access for all regardless of demand

• Accommodate new demands and expectations
  – Promote healthier lifestyles
  – Streets are part of the urban landscape, not a piece of infrastructure

• Do more with less

• Implementers of policy, not setting policy
System Users

- **Motorized users:**
  - *Large trucks, buses, RVs, light trucks, cars, motorcycles, motorbikes, personal transport (Segway)*
- **Non-motorized users:**
  - *Pedestrians, bicyclists, skateboard*
- **Considerations:**
  - *Speed, law/regulations, performance ranges*
- **Multimodal:**
  - *Increasing emphasis on accommodating non-vehicular traffic, regardless of limitations*
  - *Not enough right-of-way (ROW) to meet vehicular needs*
  - *Demand for environmentally sensitive modes*
    - *Walk, bike, bus/transit, light-rail*
• Accessibility represents the ability of different user groups to have access to the various modes of transportation
  – *Specific focus on those with disabilities*
Disabilities

- Some portion of system users have disabilities
  - Licensing may restrict operation of motorized vehicles
- Typical disabilities
  - Visual
    - Vision impaired, blind
  - Mobility
    - Wheelchair, slow
  - Age
    - Old, young
Historical Perspective

• Through 1980s
  – Traffic engineers focused primarily on vehicular traffic

• 1990: American with Disabilities Act
  – Accommodate those with limitations - started with buildings
  – ADA Accessibility Guidelines (ADAAG)
    • DOJ and DOT provisions

• Public Right-of-Way Accessibility Guidelines (PROWAG)
  – Upcoming standards for accessibility within ROW
• ADAAG is a set of design guidelines
  - Guidelines established through standards
  - Published by the Department of Justice (DOJ) and the Department of Transportation (DOT)
  - Standards used to enforce ADA law

• ADAAG standards issued by DOJ & DOT apply to facilities covered by the ADA in new construction and alterations
  - DOJ’s standards (2010) apply to all facilities covered by the ADA, except public transportation facilities, which are subject to DOT’s standards
  - DOT’s standards (2006) apply to facilities used by agencies to provide public transportation services and include unique provisions concerning:
    • Location of Accessible Routes
    • Detectable Warnings on Curb Ramps
    • Bus Boarding and Alighting Areas
    • Rail Station Platforms
• Public Right-of-Way Accessibility Guidelines
• Upcoming guidelines/standards will cover access to public ROW including:
  – Sidewalks
  – Intersections
  – Street crossings
  – On-street parking
  – Access to shared use paths providing off-road means of transportation and recreation
• Final rule expected in first half of 2016 (maybe?)
• Other areas covered or to be covered:
  – Curb ramps
  – Parking lots
  – Bus stops
  – Parks and recreational facilities
Key PROWAG Issues

- Focuses upon pedestrian elements of transportation system in the publicly owned (ROW) area
- **Purpose:**
  - Ensure access for persons with disabilities wherever a pedestrian way is newly built or altered
  - Ensure that the same degree of convenience, connection, and safety afforded the public generally is available to pedestrians with disabilities
- **Access Board developing new guidelines for public ROW that will address issues, including**
  - Access for blind pedestrians at street crossings
  - Wheelchair access to on-street parking
  - Various constraints posed by space limitations, roadway design practices, slope, and terrain
- **Guidelines will cover pedestrian access to sidewalks and streets, including:**
  - Crosswalks
  - Curb ramps
  - Street furnishings
  - Pedestrian signals
  - Parking
  - Other components
Impact to TE

- PROWAG will extend ADA considerations into traffic engineering domain
  - Intersections, sidewalks, traffic control

- Once established, traffic engineers required by law to comply with PROWAG
Why Important?

• **Why the emphasis on ADAAG and PROWAG?**
  
  – *All system users deserve equal access to system*
  
  – *Equal access not based on presence of or numbers of disadvantaged users*
  
  – *New construction, reconstruction, and alterations required to comply with new construction standards for accessibility to maximum extent feasible*

  • Exception: In alteration work, if compliance is technically infeasible, the alteration shall provide accessibility to the maximum extent feasible

  • Cost is not a trigger of infeasibility
Compliance and Enforcement

• Once PROWAG guidelines adopted
  – *Become enforceable standards under title II of the ADA*

• Violations are DOJ issue

• Can lead to federal lawsuits
  – *Forced compliance*
  – *Monetary penalties*

• Compliance required for:
  – *New construction*
  – *Alterations*
Consequences

• Kinney v. Yerusalem
  - City of Philadelphia was resurfacing without installing curb ramps
  - City argued that road-resurfacing that had no planned improvements to sidewalks did not require upgrade to ADA curb cuts

• Results:
  - Court of Appeals ruled against the City
  - Ruled that resurfacing of streets was an alteration to the adjacent curb cuts and therefore the adjacent curb ramps would have to be renovated to meet current ADA requirements
Consequences

- **Barden v Sacramento**
  - ADA case
  - Users sued city for lack of accessible sidewalks

- **Result:**
  - 20% of annual transportation fund for 30 years allocated to make pedestrian ways accessible
  - Upgrade to ramps as part of alterations would be outside of the 20%
Consequences

• **CDR v Caltrans**
  - *CDR asserted Caltrans failed to survey its 2500 miles of sidewalk and therefore could not know what access barriers exist*
  - *Lack of a Transition Plan constituted a violation of ADA*

• **Results:**
  - *$1.1 Billion over 30 years*
  - *Caltrans will pay $3.75-$8.75 million in court fees*
  - *$25-$45 million/year commitment*
    - Install 10,000 curb ramps
    - Retrofit 50,000 existing ramps
    - Reconstruct hundreds of miles of sidewalk
    - Modify 15,000 intersection pedestrian crossings (audible signals for the blind and temporary pedestrian routes)
PROWAG Elements

- Pedestrian Accessible Route (PAR)
  - *48 in wide accessible route/path*
- Sidewalk slope
  - *Max 2% cross-slope, 5% longitudinal unless matching road grade*
- Pedestrian crossings
  - *Cross slope (long for road) 2-5% max*
- Accessible pedestrian signals (APS)
  - *Locator tones*
- Detectable warnings
  - *Separate ped from road where flush*
- Roundabouts
  - *Signalized crosswalks where 2+ approach lanes*
- Curb ramps
  - *Slope and width requirements*
Examples

• Following present examples of new paradigms for urban traffic environments
City of Los Angeles

- Director of LA DOT sent me a few slides identifying how they are changing their approach
- Modeled after other initiatives
  - NYC “Measure the Road”
  - Complete Streets
  - Urban Road Design Guide
  - Urban Bicycle Design Guide
For the past 50 years, road designers have relied on these publications:
- AASHTO Green Book
- Caltrans Highway Design Manual
- Highway Capacity Manual
- Manual for Uniform Traffic Control Devices

These rulebooks are useful for conventional design, but...
- All of these manuals are the product of years worth of expertise and review in highway engineering, but they are almost wholly divorced from pedestrian, transit, and bicycle traffic considerations, and even more so, from the goal of creating thriving, successful cities.
Speeds are too high to support pedestrian safety.
Speeds of your streets are too high to support retail

To a driver: LOS A
To an economist: LOS F

To a driver: LOS F
To an economist: LOS A
NACTO: Permission slip to innovate
NACTO: Learning from our peers
Guide applied across Californian cities

Long Beach

Sacramento

Los Angeles

San Diego
How Do We Measure Success?

THEN

Mobility – Automobile
Safety

NOW

Access/Mobility – Multi-modal
Public Health/Safety
Economic Development
Environmental Quality
Livability/Quality of Life
Equity

Credit: Tom Maguire, NYC DOT
Measuring the Street

• New York City

Goals
- Design for safety
- Design for all users of the street
- Design great public spaces

Strategies
- Designing safer streets, to provide safe and attractive options for all street users...
- Building great public spaces to create economic value and neighborhood vitality...
- Improving bus service to bring rapid transit beyond the subway
- Reducing delay and speeding to allow for faster, safer travel
- Efficiency in parking and loading to improve access to businesses and neighborhoods

Metrics
- Crashes and injuries for motorists, pedestrians, and cyclists
- Volume of vehicles, bus passengers, bicycle riders, and users of public space
- Traffic speed, aiming to move traffic not too slowly, but also not too fast
- Economic vitality, including growth in retail activity
- User satisfaction
- Environmental and public health benefits

Measuring the Street:
New Metrics for 21st Century Streets
Designing safer streets
Safe and attractive options for all users

Building great public spaces
Economic value and neighborhood vitality

First protected bicycle lane in the US:
8th and 9th Avenues (Manhattan)

35% decrease in injuries to all street users (8th Ave)
58% decrease in injuries to all street users (9th Ave)
Up to 49% increase in retail sales (Locally-based businesses on 9th Ave from 23rd to 31st Sts, compared to 3% borough-wide)

Left turn bays and signal phases
Mixing zones for bicycles and left-turning vehicles
Parking-protected bike lane
Pedestrian safety islands

Expanding an iconic space:
Union Square North (Manhattan)

Speeding decreased by 16%, while median speeds increased by 14%
Injury crashes fell by 26%
49% fewer commercial vacancies (compared to 5% more borough-wide)
74% of users prefer the new configuration

Pedestrian plaza
Pedestrian safety islands
Protected bicycle path
Simplified intersections
For decades, the fields of transportation planning and design focused on moving able-bodied adults in automobiles, creating a system that provides reasonably good mobility and convenience for millions of Americans. However, the needs of travelers outside that group, including younger or older people, those with disabilities, and those who travel by transit, bicycle, or foot, have been routinely overlooked. Neighborhoods lack safe places to walk or bicycle, and access to key community resources such as parks, shops, grocery stores, and schools is now dependent on access to an automobile. Thousands of people are injured or killed while walking or bicycling every year, in part due to the inhospitable built environment. Buses move down streets slowly and drivers - when not speeding along neighborhood streets - are caught in traffic jams on major arterials.

The Complete Streets movement aims to develop integrated, connected networks of streets that are safe and accessible for all people, regardless of age, ability, income, ethnicity, or chosen mode of travel. Complete Streets makes active transportation such as walking and bicycling convenient; provide increased access to employment centers, commerce, and educational institutions; and allow greater choice in traveling so that transportation doesn’t drain a family’s piggy bank.

The term Complete Streets means much more than the physical changes to a community’s streets. Complete Streets means changing transportation planning, design, maintenance, and funding decisions. A Complete Streets policy ensures that, from the start, projects are planned and designed to meet the needs of every community member, regardless of their age, ability, or how they travel. Doing so allows a community to save money, accommodate more people, and create an environment where every resident can travel safely and conveniently.

Complete Streets can be achieved through a variety of policies: ordinances and resolutions; rewrites of design manuals; inclusion in comprehensive plans; internal policies developed by transportation agencies; executive orders from elected officials, such as Mayors or Governors; and policies developed by stakeholders from the community and agency staff that are formally adopted by an elected board of officials.
Performance Measures

Communities with Complete Streets policies measure success in a number of different ways, from system-wide multimodal performance measures to project-level indicators. Some community-wide measures may simply aggregate a project-level measure across many projects, such as the total number of accessible curb cuts, and others may address non-project specific issues, such as improved air quality. Below is a partial list of measures your community may want to include, starting from simple outputs to more challenging outcomes:

- Linear feet of new or reconstructed sidewalks
- Miles of new or restriped on-street bicycle facilities
- Number of new or reconstructed curb ramps
- Number of new or repainted crosswalks
- Number of new street trees/percentage of streets with tree canopy
- Percentage completion of bicycle and pedestrian networks as envisioned by city plans
- Efficiency of transit vehicles on routes
- Percentage of transit stops with shelters
- Percentage of transit stops accessible via sidewalks and curb ramps
- Multimodal Level of Service (MMLOS)
- Auto Trips Generated (ATG)
- Decrease in rate of crashes, injuries, and fatalities by mode
- Transportation mode shift: more people walking, bicycling, and taking transit
- Rate of children walking or bicycling to school
- Vehicle Miles Traveled (VMT) or Single Occupancy Vehicle (SOV) trip reduction
- Satisfaction levels as expressed on customer preference surveys
Welcome

Welcome to our new website! Big thanks to the team at Social Ink.
Overview

Streets comprise more than 80% of public space in cities, but they often fail to provide their surrounding communities with a space where people can safely walk, bicycle, drive, take transit, and socialize.

Cities are leading the movement to redesign and reinvest in our streets as cherished public spaces for people, as well as critical arteries for traffic.

The Urban Street Design Guide charts the principles and practices of the nation’s foremost engineers, planners, and designers working in cities today.

About The Guide

A blueprint for designing 21st century streets, the Guide unveils the toolbox and the tactics cities use to make streets safer, more livable, and more economically vibrant.

The Guide outlines both a clear vision for complete streets and a basic road map for how to bring them to fruition.

Overview

The purpose of the NACTO Urban Bikeway Design Guide (part of the Cities for Cycling initiative) is to provide cities with state-of-the-practice solutions that can help create complete streets that are safe and enjoyable for bicyclists.

The NACTO Urban Bikeway Design Guide is based on the experience of the best cycling cities in the world. The designs in this document were developed by cities for cities, since unique urban streets require innovative solutions. Most of these treatments are not directly referenced in the current version of the AASHTO Guide to Bikeway Facilities, although they are virtually all (with two exceptions) permitted under the Manual on Uniform Traffic Control Devices (MUTCD). The Federal Highway Administration has posted information regarding MUTEDC approval status of all of the bicycle related treatments in this guide and in August 2013 issued a memorandum officially supporting use of the document. All of the NACTO Urban Bikeway Design Guide treatments are in use internationally and in many cities around the world.

About The Guide

For each treatment in the Guide, the reader will find three levels of guidance:

- Required: elements for which there is a strong consensus that the treatment cannot be implemented without.
- Recommended: elements for which there is a strong consensus of added value.
- Optional: elements that vary across cities and may add value depending on the situation.

It is important to note that many urban situations are complex; treatments must be tailored to the individual situation. Good engineering judgment based on deep knowledge of bicycle transportation should be a part of bikeway design. Decisions should be thoroughly documented. To assist with this, the NACTO Urban Bikeway Design Guide links to companion reference material and studies.
Transportation System Benefits

A transportation system that takes into account drivers, bicyclists, pedestrians and transit users will contribute to the health of both people and the environment. The first rigorous nationwide investigation of the relationship between urban form, physical activity and health has shown that the type of place people live is associated with their activity level, weight and health. Researchers developed a county “sprawl index,” quantifying the extent of spread-out area where homes are far from any other destination, and high-speed arterial roads that are unpleasant or unsafe for biking and walking. According to a 2003 Smart Growth America report on the health effects of sprawl, all 22 Tennessee counties had poor sprawl indexes including Hamilton County. Across the U.S., people living in counties marked by sprawling development were more likely to walk less, weigh more, and suffer from hypertension. Communities designed with dense residential areas, mixed use neighborhoods (residential combined with commercial use), and connected streets and paths enjoy better health.

As Chattanooga’s downtown area undergoes redevelopment, it is becoming a vibrant district where residents can truly live, work and play. This redevelopment brings a potential for increase in vehicle miles traveled and roadway congestion until more Chattanoogans live in the urban core rather than commute. While in the downtown area, replacing short car trips with bicycling and walking will remove some of the burden off roads and aid in reducing congestion.