CHAPTER 1: BASIS

COMPLETE DESIGN PROCESSES & POLICIES
WHAT ARE COMPLETE STREETS?

Getting Started

This section presents the core elements of Memphis’ Complete Streets and the importance of planning and developing efficient design processes.
Complete Streets

Complete Streets are roadways that can be safely accessed, crossed, traveled upon and alongside by all people regardless of their age, ability or travel mode. A connected network of Complete Streets will ensure healthier, more equitable transportation options and an improved quality of life for all community residents, including children, seniors, people with disabilities and people facing economic hardship. The Complete Streets approach to design is neither novel nor untested; transportation professionals know how to build great streets, and there are many examples of Complete Streets in communities nationwide. This manual brings together the principles of Complete Streets to provide solid guidance for design implementation in the City of Memphis.
ELEMENTS OF A COMPLETE STREET

There is no single formula or prescription for the Complete Street, the design is “complete” when it speaks to the needs of its users within the context of the surrounding area. Not every Complete Street will (or should) include all of these elements, but the following list represents the key concepts underlying Complete Streets:

PEDESTRIANS Quality pedestrian facilities include adequate unobstructed walking space, adequate lighting, benches, trees, shading, roadway separation and on-street parking, easy access to walkable destinations and safe and frequent crossings.

BICYCLISTS Quality bicycle facilities include spaces comfortably shared with traffic, clearly marked bike lanes (or appropriate separation based on speed and volume of vehicle traffic), adequate bicycle parking, intersection treatments and destinations accessible by bicycle.

TRANSIT Quality transit facilities include connectivity to the bicycle and pedestrian network, functional shelters, separated/prioritized travel ways, coordinated land use planning, bicycle parking, lighting and walkable and bikeable distances between stops and stations.

PLACE Complete Streets are places. They do not simply link destinations; they function as destinations in themselves, including space for sidewalk dining, social gathering, exercising and relaxing. Designing Complete Streets requires an understanding of network priority and context, to move from vision to plan to implementation.

VALUE Complete Streets enhance property value and boost economic activity. This approach includes human-scale streetscapes to increase access for local residents who also benefit from cost effective, active travel. It also includes allocating right-of-way to support bicycle parking, transit shelters and to enable foot traffic from residential areas to local shops with a permeable first floor façade.
WHY COMPLETE STREETS?

Getting Started

Complete Streets benefit people and their communities. This section discusses the importance of planning and developing efficient design processes.
The objective of Complete Streets is to enable every user of a street network to reach any given community destination safely, regardless of their travel mode. To meet user needs, planners, developers and engineers must consider the many types of bicyclists, pedestrians and transit users in their community, and the different types of trips that they will take. Senior citizens, children, commuters and people with disabilities all have different needs whether they’re traveling on foot, by bicycle, or accessing transit. A complete network will provide access for each kind of user.
BEGINNING WITH PLACE 1.8

Whereas the traditional approach to roadway design is to begin at the centerline and design outward, the complete streets approach is to work from the “outside in,” beginning with the surrounding land use.

For transportation professionals, the term “Complete Streets” often evokes images of multimodal facilities, the most typical are bike lanes and sidewalks. It is natural for a roadway designer to think first about facilities and what they will look like. However, a Complete Streets approach must begin with consideration for place. That is, a project area’s surrounding land use context and how people will travel within it.

The goal of Complete Streets is not the inclusion of a facility in a cross section, but rather the safety and access of the people who will use that facility. For example, a simple striped bike lane in and of itself is unlikely to provide a safe enough space for a person to bicycle on a six-lane, high-speed thoroughfare. And on a quiet neighborhood street, a striped bike lane might be excessive and unnecessary for a safe and comfortable bicycle trip. In order to achieve appropriate and efficient designs, we must consider the land use context of a project area before selecting facilities to support users within it.

WALKABILITY AND BIKEABILITY 1.9

The terms “walkability” and “bikeability,” reference the way an environment accommodates trips by foot or by pedal. While subjective, these concepts can be assessed for planning purposes.

When evaluating walkability and bikeability, it is important to consider both the length of trips and the amenities available along the way. Generally, a 10- to 20-minute trip by an active mode to your destination or a major transit access point is considered reasonable and feasible; this translates to roughly ½ mile to 1 mile by foot and 2 miles to 4 miles by pedal. A pleasant trip on a well-designed roadway can easily extend this range.

Walkability and bikeability play key roles in creating access to transit, which in turn is a vital component of an active transportation network and particularly important in areas facing economic hardship. Every transit trip starts and ends with a walking trip. The Federal Transit Administration has issued a policy statement (FTA-2009-0052) that makes all pedestrian improvements within ½ mile of a transit stop or station, and all bicycle improvements within 3 miles of a transit stop or station, eligible for FTA funding.

A number of organizations have developed methods for rating walkability and bikeability. The University of North Carolina’s Pedestrian and Bicycle Information Center, supported by the Federal Highway Administration, gives “Walk Friendly Community” designations and rankings to communities that have demonstrated a commitment to improving and sustaining walkability and pedestrian safety. The League of American Bicyclists (LAB) awards similar designations to “Bicycle Friendly Communities.” The U.S. Green Building Council stresses walkability in its LEED for Neighborhood Development rating system, giving the most heavily weighted credit for Walkable Streets.

It’s important to note that winning any of the above designations rests on more than just the existence of bikeways and sidewalks. There is a focus on quality of facilities, a coordinated network and other ways that agencies are prioritizing safety and encouragement.
Complete Streets provide benefits to everyone, but especially to individuals and families without access to private vehicles. Providing active transportation facilities gives this population access to essential goods and services. Active transportation is also an essential component of healthy and livable communities; recognition of the interdependence between transportation, land use and the environment has resulted in a national effort to better integrate these planning and funding streams. Continued growth in population, as well as shifting demographics, will require a multifaceted approach to assure quality of life, especially in urban areas. Benefits include:

SAFETY AND SECURITY Designing streets for bicycle and pedestrian access reduces exposure to vehicular conflicts and crashes. When people can walk and bicycle they are more engaged in their environment and create more "eyes on the street", discouraging crime.

ECONOMIC Property in walkable areas often has a higher market value than similar properties with less pedestrian access to retail, schools and parks. Community businesses benefit from increased foot traffic. Looking forward, changes in U.S. demographics are likely to require shifts in transportation planning to accommodate aging populations and an increase in one-person households.

TRANSPORTATION EQUITY Automobile-focused transportation planning has created inequities in access and mobility for many, including older adults, people with disabilities, low-income families and people living in inner-city and rural communities. These groups are more likely to rely on walking, bicycling and public transit; transportation systems designed only to accommodate car transportation render those who lack car access more vulnerable and marginalized.

EFFICIENCY AND CHOICE Mobility is primarily a means to an end; the end being improved access to destinations. Complete Streets expand access and capacity for more people to reach their destinations conveniently and in a variety of ways. Providing viable alternatives to congested auto commutes improves quality of life on a day-to-day basis for an entire community.

HEALTH Active transportation is an excellent way to integrate exercise into daily routines, helping reduce obesity and related chronic illness, such as diabetes and heart disease. Access to basic facilities like sidewalks is linked to higher rates of physical activity.

ENVIRONMENT Human power is clean power. Complete Streets enable a shift from single occupancy vehicle trips to non-motorized travel, reducing emissions of pollutants that result in asthma and other respiratory diseases.

SOCIAL User enjoyment and community livability.

SUBSTANTIAL RESEARCH SUPPORTS THE BENEFITS OF INVESTMENT IN ACTIVE TRANSPORTATION:

70% of adults want more facilities for non-motorized travel.

Building sidewalks reduces pedestrian risks by 88%.

50% of all metro trips are shorter than 3 miles, and many are under 1 mile; these are bikeable and walkable distances.

By 2030, 20% of Americans will be over 71 years of age.

People without cars make twice as many walking trips.

One-third of Americans don’t drive.

Building more facilities for non-motorized travel will increase non-motorized trips (mode shift).

See Complete Streets fact sheets and Victoria Institute Study
Source: http://www.greatcommunities.org/toolkit
Since the mid-20th century, the conventional approach to roadway design has been to prioritize vehicular throughput on any given roadway. While automobile travel will always demand substantial accommodations in the built environment, the City of Memphis is a prominent community in the national movement toward a healthier, multimodal approach to planning and design. As a part of this effort, the City has adopted a default order of considerations for travel modes in the roadway project delivery process. It is as follows:

1. **PEDESTRIAN**
2. **BICYCLE**
3. **TRANSIT**
4. **AUTOMOBILE**
5. **FREIGHT**

This default is intended to influence design decisions and guide project managers toward more walkable, bikeable results when weighing alternatives and addressing tradeoffs under the constraints of project development. Chapter 2 of this manual provides more details on applying this order of considerations as well as a system of roadway typologies and land use contexts to design cross sections that accommodate active transportation.
CREATING EFFICIENCIES 1.12

The establishment of new routine considerations in day-to-day practice can be daunting for any public agency, particularly when they are based on long-term goals and principles that stem from unconventional ideals. The inspiration that drives policy can be difficult to institutionalize, and so a substantial portion of this Manual is dedicated to a coordinated project delivery process. Chapter 5 consists of a project delivery workbook to guide, organize and document the planning decisions and communications with internal and external entities that will be impacted by a given project.

COORDINATION WITH THE UNIFIED DEVELOPMENT CODE 1.13

This manual was designed with a strong link to the Memphis and Shelby County Unified Development Code (UDC), adopted in 2010. The UDC’s land use typologies, standards for building setbacks and sidewalk widths are all integrated into the right-of-way tables in Chapter 2 to ensure that cross section assemblies are consistent with existing community standards.
Getting Started

This section contains background and supporting information that illustrates the basic concepts, components and principles of Complete Streets.
CHAPTER 1: BASIS

RIGHT-OF-WAY 1.14

Complete Streets are not just between the curbs. Complete Streets consider the entire public right-of-way, which extends beyond the vehicular travel ways. In urban and some suburban settings, the far side of the sidewalk can indicate the extent of the right-of-way, but it can reach beyond such visually discernible limits.

PUBLIC, QUASI-PUBLIC, PRIVATE SPACE 1.15

Consideration for adjacent land uses is the primary step in scoping and design for a Complete Streets project. Whether privately held or public, as in parks or public institutions, land is subject to State regulation and is controlled through planning, zoning and other ordinances. Planning also must consider the quasi-public realm – property that may be privately held but “behaves” as public space, either by design or by function, such as storefronts, building facades and any other area that interacts with the streetscape.

COMPONENT ZONES 1.16

A Complete Street is a combination of smaller sub-areas or zones. This manual splits the roadway into three primary zones:

- **TRAVEL WAY** The area dedicated to on-street vehicular travel, which includes bicycles. This area often also has space dedicated to parking.
- **PEDESTRIAN REALM** The area within the public right-of-way adjacent to the travel way.
- **FRONTAGE AND SETBACK** The private and quasi-public realms just adjacent to the public right of way.

Each of these areas has associated uses and sub-components. This manual will primarily examine the pedestrian realm and travel way areas; however, examination of the context zone informs these components, as discussed below and in Chapter 2.
LAND USE CONTEXT 1.17

Land use context is the area outside of the public right-of-way. It consists of the buildings, parking lots and landscaping that is privately owned and maintained, but accessed from the public right-of-way. Building size, placement and type of use can affect the number of people that want to walk or bicycle there.

CONTEXT ZONES 1.18

Context zones are categories of development patterns based on building spacing, street network density, land use, special districts and placemaking. They describe the transition of the built environment from rural to urban settings. A roadway corridor in Memphis is likely to go through many context zones. Applying the Complete Streets approach to project development—that is, beginning with an examination of land uses—will result in dynamic designs that suit each context zone throughout the project area.
CHAPTER 1: BASIS

STREET NETWORK CONTEXT

The Complete Streets network is a series of corridors connecting people to places. While a project-based approach might focus solely on the adjacent land use context, a network context considers all users’ expectations of the entire network. The focus extends beyond a particular corridor or intersection and its adjacent land uses to include a series of places and the corridors that link these places. Individuals traveling through these places choose the modes and facilities that best meet their needs. Sometimes people choose the most direct routes; sometimes people choose the most enjoyable routes.

There are two common network patterns in metropolitan regions:

- **TRADITIONAL URBAN GRID NETWORK** A traditional development pattern characterized by regularly spaced streets that intersect at mostly right angles, resulting in connectivity and intersection density.

- **CONVENTIONAL SUBURBAN NETWORK** A development pattern characterized by large arterial corridors connecting discrete residential areas of circuitous streets and cul-de-sacs. A conventional suburban development pattern can be retrofitted to improve connectivity, but such retrofits can pose great challenges in both cost and design.
FLEXIBLE DESIGN

Complete Streets recognizes that every street is different and will require different design treatments and solutions. However, the following basic solutions are adaptable to many types of corridors and often can be used to retrofit the existing arterial corridor network:

“ROAD DIETS” Many four-lane corridors can be reduced to two lanes with a center turning lane and bike lanes. This is a practical recommendation for corridors with traffic volumes under 20,000 ADT; it also can work on corridors with volumes of 25,000 ADT, depending on turning movements. This configuration has been shown to reduce many types of motor vehicle crashes by promoting slower, more uniform speeds. It also creates safer conditions for pedestrians at intersections by reducing the number of travel lanes crossed.

“LANE DIETS” Applying a design speed of 45 mph or less on principal arterials allows for reduction of lane widths to 10 feet. A recent National Cooperative Highway Research Program (NCHRP) study has found similar safety records for 10-, 11- and 12-foot lane widths at these speeds. Additionally, recent research has shown that motor vehicle capacity is similar for lanes of 10 to 12 feet, contrary to past belief. In most cases, reducing lane width from 12 to 10 feet on a four-lane arterial will create sufficient space for a 5-foot bike lane. (AASHTO guidelines include a 1-foot gutter pan by the curb face.) This is a good solution where arterials have 5-foot sidewalks immediately adjacent to a travel lane, because the bike lane serves as a buffer to the sidewalk. If on-street parking exists, the extra foot needed often can be gained by reducing the parking lane to 7 feet.

MEDIANS Building a median between oncoming lanes can calm traffic and provide a pedestrian refuge at intersections.

INTERSECTION IMPROVEMENTS Curb extensions, textures, pavement markings, bike boxes, crosswalks, eliminating free-flow right turn lanes, tightening corner curb radii and roundabouts can improve traffic management and safety at intersections.

More details on how to incorporate flexibility into corridor design are contained in the following chapters.
The Highway Capacity Manual 2000 edition included a reduction in signalized intersection capacity of about 3% for each foot of lane width narrower than 12 feet (HCM 2000, Exhibit 16-7). However, the Highway Capacity Manual 2010 edition shows the same capacity for lanes with widths of 10 feet to 12.9 feet wide (HCM 2010, Exhibit 18-13).
COORDINATION OF COMPLETE STREETS

Getting Started

In most cases, Complete Streets design is aligned with best practices for vehicular travel way design and system optimization. Complete Streets also provide a mechanism to comply with the requirements of the Americans with Disabilities Act (ADA). However, there are limits to the uses of the right of way, and conflicts can arise as competing objectives are being balanced. This section presents some basic considerations for coordinating Complete Streets with vehicular traffic, emergency vehicles, freight traffic and ADA requirements.
Network optimization for Complete Streets should consider methods beyond those traditionally used for motor vehicles. Tools and standards such as vehicular Level of Service (LOS), capacity (or intersection thru-put), signal timing and delay and average annual daily traffic (AADT) can be used in new ways to create more livable results.

**Level of Service (LOS)**

The LOS evaluation focuses solely on impact of vehicle flow without consideration for quality of service for pedestrians, cyclists and transit users. On the project level, using LOS as the sole standard triggers mitigation measures to improve vehicle flow that can be detrimental to other modes, such as street widening, adding lanes and intersection flaring. Therefore, vehicular LOS should be supplemented with considerations of multimodal (MMLOS), pedestrian (PLOS) and bicycle (BLOS) levels of service.

Designing for a high (C or better) vehicular LOS frequently results in overdesigned auto facilities. LOS level D is the appropriate target for design of most multimodal corridors, in most contexts; periods of LOS E or even F may be considered acceptable at peak periods if this results in better conditions for all users at other times of the day. See the Appendix for more discussion on this topic.

**Multimodal Capacity**

Capacity, a measure of vehicular volume over speed, is highest for vehicles traveling at 35 mph, because vehicles at higher speeds require greater stopping distances. Widening intersections to increase throughput, using wide travel lanes, turning lanes and free-flow right-turn lanes, typically results in travel at speeds higher than 35 mph. Capacity should be defined, not by vehicle capacity, but by multimodal capacity. One way to build capacity in a constrained system, where space or context does not support additional vehicle lanes, is to use a network of overlapping grids; the vehicular grid capacity is supplemented by the bicycle, pedestrian and transit grid capacity.

**Current and Projected Traffic**

Average Annual Daily Traffic (AADT) measures a roadway’s usage by motor vehicles and helps to determine the roadway’s overall importance to the vehicular network. Designs that add accommodations for bicycles, pedestrians and transit users on high-traffic roads may impact motor vehicle capacity and bring public contention in areas with high rates of motor vehicle use. However, traffic projections based on current vehicle counts must take into account the impact that multimodal infrastructure improvements will have on users’ choice of transportation mode.

The City of Memphis has established a mode shift goal of 10% by the year 2025. That is, 10% of all trips taken in the city will be by foot, bicycle, or transit. Wherever possible, infrastructure decisions should support this goal for community-wide change in travel behavior. A distance of one mile or less can be comfortably walked or bicycled by most people, yet 2/3 of trips under one mile are taken by car. When the transportation system accommodates pedestrians and cyclists, people will be more likely to choose alternative modes, relieving congestion and substantial amount of vehicle demand from roadways.

To this end, planning processes, network and roadway designs and projects based simply on growth projections for vehicle miles traveled (VMT) should be reevaluated and a transition should be made aimed at maintaining, or even reducing, current traffic levels by supporting mode shift that will reduce motor vehicle use and relieve congestion.
INTERSECTION VS. STREET CAPACITY

In urban networks, intersection (or node) capacity is a greater determinant of overall network capacity than street or link capacity. It is most important to consider the capacity at intersections, where congestion is most likely. Congestion on narrow streets can be reduced by good intersection design, which enhances capacity at intersections by using roundabouts, strategically placed left- or right-turn lanes, signal timing, etc.

SIGNAL TIMING

Signal timing is an effective mechanism to control actual travel speeds. Signal timing should be linked to target speeds and should be a factor in the selection of design alternatives. Across the network, the most effective grid optimizations can be achieved by signal locations spaced ¼ mile apart. Greater spacing allows vehicles to accelerate beyond the optimum speed between signals, while more closely spaced signals are difficult to time on streets where there is a lot of cross traffic. Pedestrian crossings should be provided at more frequent intervals.

PEAK-HOUR LANES

Peak-hour lanes are center-turn lanes or parking lanes that become travel lanes during peak traffic times. A peak-hour lane is marked like a turn lane, solid yellow on the outside and dashed yellow on the inside, with a sign – usually a red X or green arrow – above the lane to indicate whether it is open for travel. Center-turn lanes used for peak-hour travel can be reversible, with traffic switching direction based on peak period flow; dedicated reversible lanes also can be used. Peak-hour lanes can be useful in expanding bicycle and pedestrian access during non-peak times.
CHAPTER 1: BASIS

COORDINATION WITH PARKING/FLEX LANES

In most cases, parking lanes should not be used as bicycle lanes, because these shared lanes encourage unpredictable movements by cyclists as they swerve around parked cars. In some instances, however, parking-bike flex lanes can have useful applications and can facilitate more efficient traffic flow. For example, in many residential corridors, most residents park their cars in private driveways and garages, and on-street parking is used only occasionally, mostly by visitors and delivery vehicles. In these neighborhoods, a parking-bike flex lane, marked by a solid white line 7 feet off the curb face, can be a practical solution that promotes bicycle riding while meeting residents’ intermittent needs for on-street parking.

FIGURE 1.21
PARKING/FLEX LANE
Memphis, TN

FIGURE 1.22
EMERGENCY RESPONSE VEHICLE
Chicago, IL

COORDINATION WITH EMERGENCY VEHICLES

Fire professionals, police officials and ambulance services are key stakeholders in the implementation of Complete Streets policy and should be included in all review processes. They provide unique perspective on the uses and demands of corridors in the areas they serve.

At present, work is under way to integrate progressive street design with existing standards for fire truck access as outlined in the International Fire Code (IFC). The Congress for New Urbanism has proposed amendments to the IFC that address the need to maintain access for fire trucks, while also reflecting research showing that wider streets lead to higher traffic speeds and increased risks of fatal collisions. Although this initiative has not yet achieved revisions to the IFC, the Code does give local service providers flexibility to review and approve traffic calming measures and other exceptions. (Because police cars and ambulances are smaller than fire trucks, they do not pose the same design concerns.) Conflicts with existing fire codes may be resolved through a thoughtful review of proposed design changes. For example, because all roadway users must yield to emergency vehicles when sirens and flashing lights are activated, there is no functional difference between a roadway with two 12.5-foot traffic lanes and a roadway with two 10-foot traffic lanes and a 5-foot bike lane. A bike lane could easily facilitate the need to yield to emergency vehicles. Additionally, by expanding the grid network and providing more alternative routes, Complete Streets can help municipalities deliver emergency services more swiftly and efficiently. In one study, the City of Charlotte found that fire department service in grid areas cost about $159 per capita, compared to $740 per person in less connected areas.

See CNU Emergency Response and Street Design Initiative