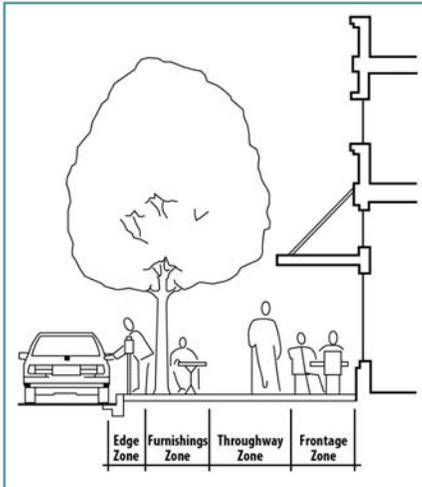


To achieve a more balanced split among travel modes and build a vibrant urban community, many streets within the Strip District should reflect a pedestrian scale. This means focusing on moving people rather than vehicles, slowing vehicle operating speeds, having compact and efficient intersections, and allowing efficient use of available space devoted to non-motorized modes.



Pedestrian roadside zones (source: Community Design + Architecture)

Pedestrian Roadside Environment

Elements within the pedestrian roadside environment, such as paved surfaces, plantings, and amenities, can enliven a street and help to facilitate social interaction among people - transforming the street into a place. This environment consists of four distinct functional zones, each of which plays an important role in establishing an appropriate pedestrian environment. The zones and key features are:

- **Edge Zone** - The area between the face of curb and the furnishing zone that provides the minimum necessary separation between objects and activities in the street side and vehicles in the street.
- **Furnishings Zone** - A buffer between pedestrians and vehicles, often with landscaping; public street furniture including bicycle racks, benches, trash receptacles, and transit stops/shelters; signage; and utilities.
- **Throughway Zone** - The walking zone that must remain clear both horizontally and vertically for the movement of pedestrians. The appropriate width will vary based on the street, its uses, and its pedestrian volume. The zone should be no narrower than 6-8 feet in any commercial setting.
- **Frontage Zone** - The “shy zone” is the buffer between the throughway and window shoppers, appurtenances, and doorways along the building front or private property line. It may contain private street furniture, signage, merchandise displays, and café tables and seating. Awnings, canopies, and overhangs should cover this area and extend into the throughway zone to protect pedestrians from sun and inclement weather.



Bicycle racks and transit shelters are part of the furnishings zone in the pedestrian roadside environment (East Lansing, MI)

Intersections

Intersection improvements that facilitate safe pedestrian crossings will be important on all corridors, but particularly along Liberty Avenue and Smallman Street. For example, the existing intersection at Smallman Street and 21st Street can be made significantly more compact to both slow vehicular traffic and decrease the exposed crossing distances for pedestrians. Treatments that help to make intersections more compact and efficient, and make crossings safer and less intimidating include appropriately narrow lanes and curb radii, curb extensions, channelized right turn islands, raised pedestrian crossings at channelized islands, high visibility crosswalks, medians and median noses, bicycle lanes (including color at conflict points), signal improvements such as countdown pedestrian timers, street trees, lighting, and integration of transit stops and amenities.



Curb extensions in Venice, FL

Curb Extensions move the curb line into the street, narrowing the street at intersections or midblock locations and reallocating a portion of the street space to pedestrians or ancillary uses such as landscaping, lighting, art, signage, or street furniture. They are most effective when used in areas with on-street parking such as Penn Avenue and Smallman Street. Benefits include reduced pedestrian crossing distance, enhanced visibility of pedestrians waiting to cross, and reduced traffic speeds.



High-visibility ladder-style crosswalk markings in Corpus Christi, TX

High-Visibility Crosswalks alert motorists to potential pedestrian conflict areas, enhance motorists' recognition of intersections, increase motorists' yielding to pedestrians, attract pedestrians to the best crossing places, and assist people with visual impairment in their crossing. Ladder style markings are preferred because they are more visible to motorists than transverse lines. Many locations in the Strip District are already using high-visibility ladder style markings, but these should be placed at all locations with significant pedestrian activity.

Traffic signal enhancements for pedestrians and bicyclists include the use of pedestrian countdown signals, leading pedestrian intervals (LPI), yield to pedestrians blank-out signs, pedestrian push button enhancements, and bicycle detection and markings.



Leading pedestrian interval in Tampa, FL

- **LPIs** provide the pedestrian a head start (typically 3-5 seconds) before motor vehicle traffic is given a green light, thereby helping to reduce pedestrian conflicts with turning vehicles.
- **Yield to pedestrian blank-out signs** increase awareness of crossing pedestrians at intersections. They typically read "Yield to Peds" during the concurrent movement green signal phase. Optionally they can read "No Turn on Red" during the conflicting movement phases if the desire is to prohibit this movement for the benefit of pedestrians legally crossing the path of the right on red movement.
- **Pedestrian push button enhancements** can be made at signalized intersections that are not set to automatically recall the pedestrian signal phasing by providing automatic feedback to users (similar to elevator buttons that light up when pushed).
- **Bicycle detector markings** show bicyclists the proper lane positioning at an intersection to trigger a green light.

Channelization can be used to minimize pedestrian crossing distances at excessively wide intersections or along corridors with unused space. Channelization on corridors can be realized by implementing median refuge islands that allow pedestrians to cross one direction of traffic at a time. With most street sections in the Strip District having tight geometrics and limited right-of-way, there are fewer opportunities to use channelization. However, the Smallman Street corridor, particularly at the 21st Street intersection is one candidate, along with Liberty Avenue if that corridor is ultimately converted to a three-lane section with center turn lane.



Pedestrian push button providing feedback to users when pressed (Charlotte, NC)



Right turn channelizing island



Rectangular rapid flashing beacon (RRFB) in St. Petersburg, FL



Pedestrian hybrid beacon (PHB) in Phoenix, AZ



On-street bicycle parking "corral" on Pittsburgh's South Side.

Midblock Pedestrian Crossings

For blocks longer than 400-500 feet, there may be a need to place crossings at midblock locations. Pedestrians will often go up to 150 feet out of their way to reach a well-designed, safe crossing. Many of the same treatments used at intersections also apply at midblock locations, such as curb extensions (with on-street parking), high-visibility crosswalks, and lighting. However, additional treatments may be appropriate to call attention to midblock crossing locations and ensure appropriate motorist yielding behavior, such as:

- **Rectangular Rapid Flashing Beacons (RRFBs).** RRFBs are an experimental form of flashing beacon, although approved for interim use by FHWA. They use rectangular shaped high-intensity LED-based indications to supplement standard pedestrian crossing signs at uncontrolled crossings. The beacons flash rapidly in a "flickering" pattern, greatly improve the percentage of motorists yielding to pedestrians at a midblock location.
- **Pedestrian Hybrid Beacons (PHB).** PHBs are pedestrian actuated traffic control devices that provide a dark indication to motorists until activated by a pedestrian and a solid red indication is provided directing motorists to stop. The solid red advances to flashing red, allowing motorists to proceed with caution once a pedestrian is clear. PHBs can be used at locations where a full traffic signal is not warranted.

Features of Bicycle Facilities

Accommodations for bicyclists range from shared lanes to dedicated on-street bicycle lanes and cycle tracks, to dedicated off-street spaces such as shared use paths. The needs of cyclists must be considered as the roadways within the Strip District are evaluated and planned, including proximity to parked vehicles, proper placement of facilities at intersections, and provision of end-of-trip facilities such as bicycle racks. Racks or corrals, using the City's standard, should become a standard feature in the streetscape of the Strip District to provide convenient parking.

- **Bicycle lanes** are the portion of a roadway which has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists. They may be supplemented with buffering or colorization.
- **Buffered bike lanes** are conventional bicycle lanes paired with a designated buffer space separating and providing greater space between the bicycle lane and the adjacent motor vehicle travel lane and/or parking lane/"door zone". Buffering may be considered adjacent to parking lanes, or on roadways with high travel speeds, high travel volumes, high amounts of truck traffic or streets with extra lanes or wide lanes.
- **Colored pavement** may be applied within bicycle lanes at intersections, driveways, conflict areas, and along non-standard or enhanced facilities, such as cycle tracks.



Bicycle & Pedestrian Accommodation



Bicycle lane in Tempe, AZ



Buffered bicycle lane in Seattle, WA



Colored pavement within bicycle lane conflict area in Austin, TX



Shared lane markings in Winter Park, FL

- **Shared Lane Markings**, also known as “Sharrows”, are markings that are used in lanes that are shared by bicycles and motor vehicles when a travel lane is too narrow to provide a standard-width bicycle lane. Note that sharrows should only be used in this case; efforts should be made to provide exclusive space for bicyclists such as bike lanes or cycle tracks. The mode shift toward bicycles is more effective when the users feel safer.

Features of Bicycle Lane Facilities:

Bicycle lanes offer numerous benefits, with many extending to roadway users other than bicyclists:

- Perceived to encourage bicycling. Studies have shown increased levels of bike commuting trips based on proximity to bicycle facilities.
- Serve as a symbol to many that bicyclists belong on the road rather than the sidewalk.
- Encourage more predictable behavior by both motorists and bicyclists.
- Allow motorists to pass bicyclists with less delay and with fewer passing conflicts.
- Increased border width to fixed objects.
- Increased turning radius at intersections and driveways including for trucks and buses.
- Improved sight distances when exiting driveways and at intersections.
- Buffer to sidewalks increases comfort of pedestrians, and buffer to parking lane helps people more easily exit parked cars.
- Traffic calming (when used in conjunction with narrower travel lanes).
- Space for disabled vehicles, mail delivery, bus stops, and place for cars to pull into when emergency response vehicles pass.
- Provide structural support to the pavement.
- Discharge water further from the travel lanes.
- Buffered bicycle lanes increase cyclist comfort through the greater separation between the cyclist and adjacent motor vehicle traffic and/or parked vehicles and opening doors. They also provide a greater space for bicycling without making the bike lane appear so wide that it might be mistaken for a travel lane or a parking lane.
- Colored pavement within a bicycle lane increases the visibility of the facility.

Shared lane markings let motorists know to expect bicyclists, provide lateral positioning guidance to bicyclists (particularly in reference to adjacent on-street parking), and reinforce good bicycling behavior such as riding outside the “door zone”, riding further out in the travel lane (discourages motorists squeezing by), and discouraging sidewalk bicycling and wrong-way bicycling.



Well designed pedestrian facilities like this sidewalk in Raleigh, NC can encourage active transportation

There is growing awareness across communities of the impact that transportation systems have on quality of life and health. Expanding the availability of, safety for, and access to a variety of transportation options has the potential to save and improve lives and enhance quality of life. Integrating health-enhancing choices into the transportation system and supporting policies can help prevent chronic diseases, reduce and prevent motor vehicle-related injury and deaths, and improve environmental health. Likewise economic development is stimulated and access is afforded to all people. With the proposed changes in land use, transportation network, and multi-modal opportunities, the Strip District Plan provides an ideal opportunity to incorporate designs to enhance community and individual health benefits. For example, the natural result of a mode shift from driving to walking or biking is an increase in personal health and improved air quality within the community.

The manner in which built environment and transportation systems impact health include:

- The declining rate of physical activity leads to multiple chronic health conditions.
- Motor vehicle crashes are leading causes of injury-related deaths.
- Walking and bicycling is seen as unsafe.
- A lack of transit, pedestrian and bicycle options disproportionately affects vulnerable populations.
- Air pollution from motor vehicles contributes to respiratory and cardiovascular health effects.

Features of Increased Health Benefits

Although not part of this plan, a Health Impact Assessment (HIA) can be an important long-term feature. Key principles of this tool might be applied to help enhance and transform the Strip District. HIAs seek to identify the health consequences of plans, projects, and policies traditionally considered to be outside the health sector domain. With the dual goals of maximizing health benefits and minimizing adverse health effects, HIAs aim to help stakeholders and policy-makers weigh the merits and drawbacks of a proposed project, compared with alternate approaches.

Benefits of Improving Community Health

The Centers for Disease Control and Prevention's (CDC) document *Recommendations for Improving Health through Transportation Policy* recommends how to include public health within transportation plans. Benefits include:

- **Reduced injuries associated with motor vehicle crashes.** Examples include community designs that address roadway safety issues and promote reduced traffic speeds in neighborhoods (traffic calming); and policies which improve driver behavior. This will be critical in the Strip District as both



The provision of exclusive bicycle facilities such as bike lanes in Santa Barbara, CA encourages both recreational and utilitarian trips to be made by bicycle

Community & Individual Health Benefits



Public transit systems such as the Portland streetcar can help to reduce vehicle traffic by expanding the range of pedestrian trips

Liberty Avenue and Penn Avenue were identified as high crash corridors, including for bicycle crashes. Steps are being put in place to improve safety along Liberty Avenue and within the District.

- **Increased active transportation.** Examples include well lit sidewalks, shared use paths, and safe roadway crossings, and street design measures.
- **Improved air quality.** Examples include traffic congestion mitigation and better air quality and more transportation choices that reduce emissions.
- **Expanded public transportation.** Examples include increased transit that encourages transit-oriented developments; and improves bicycle and pedestrian connectivity to stops and stations.
- **Healthy community design.** Examples include street networks that facilitate active transportation and public transit to increase connectivity and promote active transportation for all ages.

Cycle Tracks



A one-way cycle track in New York City with a striped hatched area to separate the track from on street parking. Green paint was used on the surface of the cycle track.



A two-way cycle track in St. Petersburg, FL, separated from the parking and travel lanes by a raised concrete separator.



Example of a striping. This allows left turners to merge into a shared cycle track and turn lane area prior to an intersection. This cycle track is located on the left side of a one-way street.

For many years, the bicycle lane has been the facility most associated with accommodating bicyclists on urban streets. While bicycle lanes are satisfactory for some users, they place bicyclists on the roadway next to motor vehicle traffic. Recently, there are newer, lower-stress bicycle facilities that are physically separated from moving traffic being promoted as a way to increase bicycling. Cycle tracks are examples of these lower stress facilities, and they appeal to a wide variety of bicyclists.

Features of Cycle Tracks

Cycle tracks are typically for bicycle use only and physically separated from motorists. On some roads, on-street parking, combined with hatched out painted areas, separates cycle tracks from motor vehicle lanes. For other roads, curbs are used to protect cycle tracks from motor vehicle travel lanes.

Pedestrians are accommodated on adjacent sidewalks. If cycle tracks are constructed at the same level as the sidewalk they usually are surfaced with a different pavement color and/or textured material.

Benefits of Cycle Tracks

Many bicyclists feel more comfortable riding on cycle tracks than on facilities integrated into the motor vehicle travel way, such as bike lanes or shared lanes. By increasing the comfort of people who may bicycle, the number of individuals choosing to ride bikes for recreational and utilitarian purposes increases.

Cycle tracks are most often placed between sidewalks and the travel lanes. Consequently, cycle tracks can improve pedestrians' perceptions of the roadway. Separation from motor vehicles is a significant factor impacting how safe and comfortable pedestrians feel while walking along a roadway.

In addition, transit can benefit from cycle tracks. If designed with comfortable transit waiting areas on a concrete separator, cycle tracks can reduce "leap frogging" that occurs when bicyclist and buses share an outside travel lane. Also, by making it easier to bicycle to transit stops, the capture area for transit is increased.

Raised buffers used for cycle tracks can contribute to green streets by providing space for plantings and underdrains.

Buffers can provide a space for not only landscaping, but for public art and ornamental lighting as well.

Designing a Safe Facility

The American Association of State Highway and Transportation officials (AASHTO) *Guide for the Development of Bicycle Facilities* cautions strongly against installing shared use paths adjacent to the roadway. Most of the cautions in the AASHTO's *Guide* are concerned with potential interaction between bicyclists and motorists at conflict points. In its Cycle Tracks section, the *National Association of City*

Cycle Tracks



Example of a chicane on a two-way cycle track. The design speed of the curves approaching an intersection slows bicyclists approaching the conflict area.



This signal head for bicycles is modified to show the bicycle symbol instead of the traditional circular signal displays.

Transportation Officials Urban Bikeway Design Guide acknowledges those AASHTO's cautions by providing the following as one of its criteria for "Typical Applications" of cycle tracks:

"Streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments."

Applying effective mitigation methods to conflicts at intersections is the key to safe cycle track design.

- **Visibility** at conflict areas must be managed to help ensure motorists and bicyclists have the time to see and react to each other at intersections and driveways.
- **Speeds** of motorists and bicyclists must be managed on the approach to conflict points by using chicanes and tight turning radii. Both increase safety. They also increase the likelihood of users safely reacting to conflicts.
- **Merging** areas should be clearly delineated with pavement markings.
- **Driveway** conflict areas can be emphasized with colored asphalt or concrete.
- **Signals** can be used to separate movements by giving the cycle track an exclusive movement time as part of the traffic signal cycle.

Wayfinding signs can tie the Strip District's bicycle facilities into a more regional network of bicycle routes. They can further promote bicycling by pointing out destinations that are served by not only the Strip facilities but also by connecting bikeways.

Numerous communities around the nation are building cycle tracks and their experiences can serve as models for development of cycle tracks for the Strip District. New York City, St. Petersburg, FL, Portland, OR are among those communities that can be models to promote cycling and make places more livable. By building upon their experiences, cycle tracks could play a key role in providing the Strip District a true multi-modal network.