Pedestrian and Bicycle Planning and Design Best Practices Resource Guide

September 2004

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Purpose of This Guide

METROPLAN ORLANDO has created this Pedestrian and Bicycle Planning and Design Best Practices Resource Guide to assist local governments with the development of new or alternative land development codes that will improve conditions for walking and bicycling as modes of transportation. The term **"should"** *is used throughout this document for most features, measurements and other elements. Local governments can replace* **"should"** *with* **"shall"** *where appropriate for their own codes.*

A number of other useful publications are referenced in the Resources section. Many of these documents are included in the CD with this document.

Relationships between Residential, Commercial and Civic Uses

Conventional suburban development is inherently anti-pedestrian and also discourages bicycle travel. By segregating land uses, distances for most trips are beyond what the average pedestrian will make, even with ideal walking conditions.

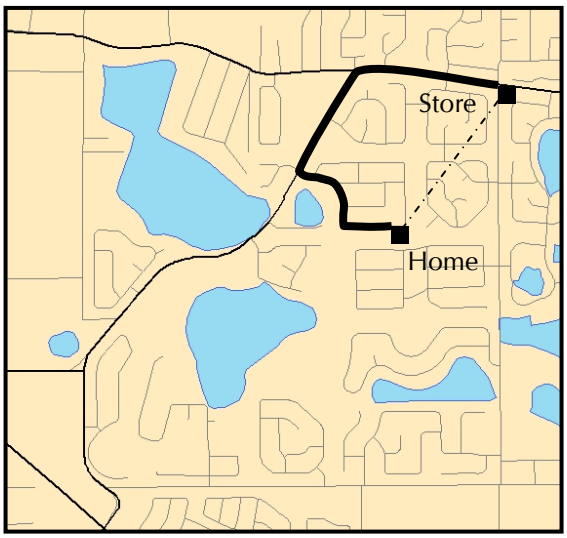
The Congress for the New Urbanism has set out principles for growth and development that shift orientation from the private motor vehicle to walking, transit and bicycling. The second section of the Charter for the New Urbanism states:

The Neighborhood, the District, and the Corridor

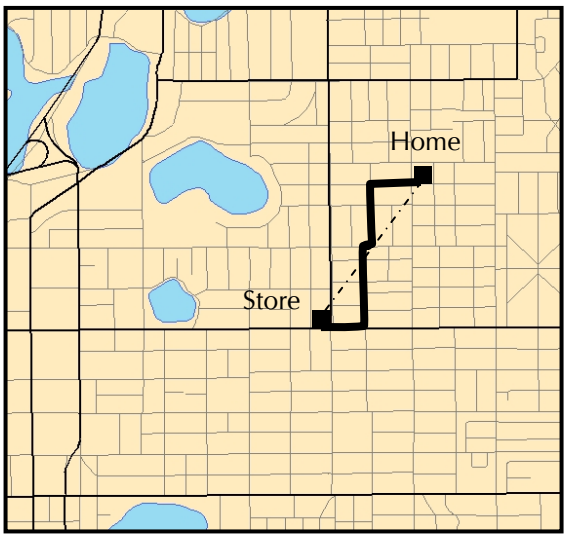
1. The neighborhood, the district, and the corridor are the essential elements of development and redevelopment in the metropolis. They form identifiable areas that encourage citizens to take responsibility for their maintenance and evolution.
2. Neighborhoods should be compact, pedestrian-friendly, and mixed-use. Districts generally emphasize a special single use, and should follow the principles of neighborhood design when possible. Corridors are regional connectors of neighborhoods and districts; they range from boulevards and rail lines to rivers and parkways.
3. Many activities of daily living should occur within walking distance, allowing independence to those who do not drive, especially the elderly and the young. Interconnected networks of streets should be designed to encourage walking, reduce the number and length of automobile trips, and conserve energy.
4. Within neighborhoods, a broad range of housing types and price levels can bring people of diverse ages, races, and incomes into daily interaction, strengthening the personal and civic bonds essential to an authentic community.
5. Transit corridors, when properly planned and coordinated, can help organize metropolitan structure and revitalize urban centers. In contrast, highway corridors should not displace investment from existing centers.
6. Appropriate building densities and land uses should be within walking distance of transit stops, permitting public transit to become a viable alternative to the automobile.
7. Concentrations of civic, institutional, and commercial activity should be embedded in neighborhoods and districts, not isolated in remote, single-use complexes. Schools should be sized and located to enable children to walk or bicycle to them.
8. The economic health and harmonious evolution of neighborhoods, districts, and corridors can be improved through graphic urban design codes that serve as predictable guides for change.
9. A range of parks, from tot-lots and village greens to ball fields and community gardens, should be distributed within neighborhoods. Conservation areas and open lands should be used to define and connect different neighborhoods and districts.

Street Network

The poorly connected street network of conventional suburban development compounds the problem of segregation of uses. Local streets are discontinuous in such networks, forcing all trips onto the collector and arterial streets, further increasing trip distances for pedestrians and bicyclists and shifting more trips to private motor vehicles. The resultant motor vehicle volumes make such collector and arterial streets uncomfortable and/or dangerous for pedestrians and cyclists.



Conventional Suburban Street Network
Square Miles – 2.5
Centerline Street Miles – 34.5
Number of Links – 227
Number of Nodes – 189
Link to Node Ratio – 1.20
Centerline Miles per Sq. Mile – 13.8
Nodes per Square Mile – 75.6
Sample Home-to-Store Trip: 0.5 miles "as the crow flies;" 1.2 miles actual; 64% on collector roads; round-trip walk 53 minutes



Traditional Gridded Street Network
Square Miles – 2.5
Centerline Street Miles – 57.4
Number of Links – 682
Number of Nodes – 443
Link to Node Ratio – 1.54
Centerline Miles per Sq. Mile – 22.9
Nodes per Square Mile – 177.2
Sample Home-to-Store Trip: 0.5 miles "as the crow flies;" 0.75 miles actual; 13% on arterial street; round-trip walk 33 minutes

Cities and towns should strive to provide a higher ratio of nodes (intersections) to links (the sections of streets between adjacent intersections). The example above on the right provides shorter trip distances as well as a variety of route choices for all modes. This is especially important for pedestrians and transit users. On the Conventional Suburban Street Network, nearly all trips must use the collector and arterial streets, which generally have poorer walking or bicycling conditions tan the local streets. On the Traditional Gridded Street Network, most trips can be accomplished on local streets.

For a thorough exploration of the benefits of Traditional Gridded Street Networks over Conventional Suburban Street Networks, see "Traditional Neighborhood Development: Will the Traffic Work?" by Walter Kulash.

Town Center Street Guidelines

The following guidelines are based on those developed by the City of Orlando for the Baldwin Park development, and have been made generic for other jurisdictions. Other minor changes have also been made.

The following guidelines and standards apply to the Town Center:

(a) Mid-Block Connections. Provide pedestrian and/or auto connections at mid-block locations for mixed use and commercial blocks to increase the permeability of the site and encourage walking for some daily trips. Mid-block connections should be provided every 200 to 400 feet.

Mid-block "paseo" in Los Gatos, CA

"Big-box" retail on a main street in Santa Cruz, CA

(b) Placement of Commercial Activity. The configuration of everyday shops in the Town Center should balance pedestrian and auto comfort, visibility, and accessibility. Building setbacks from public streets should be minimized. Primary ground-floor commercial building entrances should orient to plazas, parks, or pedestrian-oriented streets, not to interior blocks or parking lots. Anchor tenant retail buildings may have their entries from off-street parking lots or structured parking but are also required to have direct pedestrian connections to surrounding streets. On-street entries are strongly encouraged.

(c) Relationship of Building to Public Spaces. Buildings should reinforce and revitalize streets and public spaces, by providing an ordered variety of entries, windows, bays, and balconies along public ways. Buildings should have human scale in details and massing. Free-standing or "monument" buildings should be reserved for public uses.

Movie theater facing a main street plaza in Santa Cruz, CA

(d) Public Spaces. Greens and plazas may be used to create a prominent civic component to core commercial areas. Greens should be between 1 and 3 acres in size; plazas may be smaller. They should be placed at the juncture between the core commercial area and surrounding residential or office uses.

Philadelphia City Hall creates a terminating vista.

(e) Civic Uses. Civic services, such as community buildings, government offices, recreation centers, post offices, libraries, and daycare, should be placed in central locations as highly visible focal points. Where feasible, they should be close to transit stops.

(f) Pedestrian and Multi-Modal Design. Streets and other public outdoor spaces within the Town Center should be functional, attractive, and designed to enhance the pedestrian life of the community. Seek to create a balanced transportation system that invites pedestrians, bicyclists, and transit riders, as well as motor vehicles. Provide a fine grain system of connections to maximize choices for all modes of travel.

State Street in Santa Barbara, CA.

Pedestrian and bicyclist connection in Davis, CA.

(g) Direct Pedestrian Connections from surrounding neighborhoods. When existing developed areas are redeveloped or retrofitted, ensure that pedestrian and bicyclist access from adjacent neighborhoods and destinations are provided. (Davis, CA)

(h) Arterial Streets as Edges. Arterials streets should be considered edges of the Town Center, unless they are designed as a one-way couplet or substantial pedestrian improvements are made and traffic through the Town Center is slowed. The Primary Conservation Network may also be used as an edge for the Town Center.

(i) Transit. The Town Center should be the primary stop on the regional transit system. Transit stops should, whenever possible, be centrally located and adjacent to the core commercial area. Commercial uses should be directly visible and accessible from the transit stop. Transfers to feeder buses (local bus network) should be provided for in the design and location of these stops. A preferred route for transit should be determined at the outset of planning, and those streets should be designed to accommodate transit vehicles.

Apartments and retail served by a light rail station in Mountain View, CA.

Pedestrians are given priority in this parking lot crossing in Los Gatos, CA.

(j) Parking Lots. Lots should be designed to accommodate safe pedestrian circulation using internal pedestrian corridors and limiting the time and distance pedestrians must walk behind parked vehicles. Amenities that will provide "eyes-on-the-lot" are encouraged, such as shaded outdoor dining areas, benches and employee break areas.

Street Design

The following guidelines are based on those developed by the City of Orlando for the Baldwin Park development, and have been made generic for other jurisdictions. Other minor changes have also been made.

Street Sections

Each cross section details lane width, medians, bicycle lanes, parking, sidewalks, landscape areas, drainage (rural roadways), and required right-of-way. Not all contingencies have been covered because the list would be far too large. However, cross sections may be modified to accommodate special circumstances. For example, it may not be desirable to have a sidewalk on the side of a roadway fronting a wetland; the appropriate cross section can be developed by deleting the sidewalk from the cross section designed for the particular type of roadway.

(a) Cross Section Types. Cross sections have been developed for arterials (urban and rural), mixed-use center streets (arterial and local), residential neighborhood streets, residential and connector streets, and airport support district streets. Arterials are defined as major high-volume roadways such as *Generic Road* and *Generic Street*. Town and Village Center streets should be composed of arterial and local streets. Neighborhood Center streets should be local in nature. Residential Neighborhoods should be comprised of connector and local streets. Residential and commercial connector streets should provide vehicular connections between residential neighborhoods and commercial centers.

(b) Specific Requirements for Residential Neighborhoods. Residential neighborhood local streets reflect the options available for three levels of on-street parking. Whether there is no on-street parking, limited on-street parking or unlimited on-street parking should be determined by presence or absence of one- or two-car garages and the resulting driveway width. The specific roadway cross-section should be determined at the time of site plan review based on the proposed unit types fronting the roadway.

(c) Street Trees and Utilities. Electrical, telephone and cable transmission lines and natural gas lines should be placed in alleys wherever feasible. This frees the parkway for canopy-sized trees. Trees should be planted in the parkways of residential and village center streets to provide significant shade and be species native to Florida. Street trees are encouraged on Town Center streets.

The core cross sections referenced above are summarized in the following table.

Typical Local Street Cross Sections

Major Urban Arterials or Collectors	Parking	Bicycle Lanes	Street Trees	Sidewalks	Minimum ROW (feet)	Lane Widths (feet)
Town Center:						
One-Way Two-Lane	Both Sides	Yes*	Yes	12 feet**	72	11
Two-Way Four-Lane Divided	Both Sides	Yes*	Yes	12 feet**	120	11
Village Center:						
One-Way Two-Lane	Both Sides	Yes*	Yes	10 feet**	68	11
Two-Way Four-Lane Divided	Both Sides	Yes*	Yes	10 feet**	116	11

Two-Lane Local Streets	Cross Section	Parking	Bicycle Lanes	Street Trees	Sidewalks	ROW (feet)	Lane Widths (feet)
Town or Village Center:							
Option 1	D1	Both Sides	No	No	10 feet	58	10
Option 2	D2	Both Sides	No	Yes	8 feet	62	10
Residential:							
Boulevard	E	No	Yes	Yes	7 feet	77	10
Boulevard	E	Yes	Yes*	Yes	7 feet	93	10
Local Street Type 1	B	Both Sides	No	Yes	5 feet	53	9
Local Street Type 2	C	Both Sides	No	Yes	5 feet	62	10
Lane	A	1 Side Only	No	Yes	5 feet	38-40	8-9
Alley (Two-way)	F	No	No	No	No	20-22	10-12
Alley (One-way)	F	No	No	No	No	16	8
Cul de Sac Type 1	G	Yes	No	Yes	No	32	NA
Cul de Sac Type 2	G	Yes	No	Yes	Yes	52	NA

Sources: Adapted from Glatting Jackson Kercher Anglin Lopez Rinehart, Inc. and *Street Design Guidelines for Healthy Neighborhoods*, by Dan Burden, Michael Wallwork, Ken Sides, Ramon Trias & Harrison Bright Rue.

* Use extreme care in providing sufficient bike lane width adjacent to parallel on-street parking. Bicyclists should never ride or be forced or encouraged to ride within 3 feet of a parked car. Crashes involving a bicyclist and an opening car door have ***very high potential for serious injury and death***. The *AASHTO Guide for the Development of Bicycle Facilities* illustrates a combined parking lane/bike lane of 11 feet (measured from the curb face to the inside bike lane stripe), and recommends 13 feet for areas with "substantial parking turnover" (e.g. commercial areas). (The Florida Bicycle Facilities Planning and Design Handbook also recommends 13 feet.) In both cases, a bicyclist who rides in the center of the bike lane will be within the "door zone." Providing 14 feet for the combined parking lane/bike lane allows cyclists to ride completely outside the door zone. Designers should consider not striping a bike lane in places where right-of-way or pavement width are insufficient to provide 14 feet.

Street Cross Section Details

When does a street need bike lanes?

The FDOT Bicycle Level of Service model can help you determine whether or not a street needs bike lanes, but generally speaking cul de sacs, alleys, lanes, local streets, and village center streets do not need them. Bicycle lanes are most useful on arterial and collector roads; they may be appropriate on residential boulevards if traffic volumes warrant. Example:

On-street parking (100% usage) and no bike lanes; 5,000 ADT = BLOS D

On-street parking (100% usage), bike lanes; 5,000 ADT = BLOS C

No on-street parking, 11 ft. lanes and no bike lanes; 5,000 ADT = BLOS D

No on-street parking; 11 ft. lanes and 4 ft. bike lanes; 5,000 ADT = BLOS B

Accommodating Transit

The street measurements and characteristics in this section may need to be modified if transit buses are planned or expected. Refer to the Lynx Central Florida Mobility Design Manual for specific transit needs.

Street Types

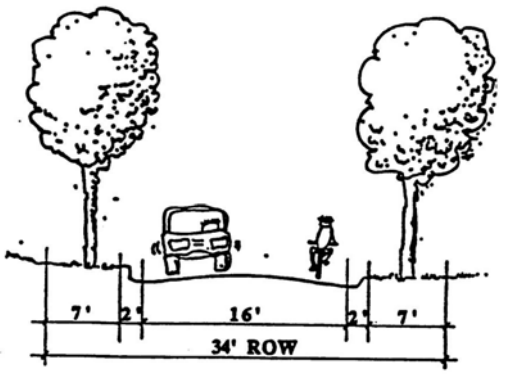
(A) *Lane.* Lanes provide access for service vehicles and access to adjacent land use. Lanes should predominantly carry traffic having either a destination or origin on the street itself.

a. Land Use: Single Family.

b. Specifications:

34' ROW.
Two 7' parkways.
Two 8' lanes.
15' curb radii.
20 mph posted speed.
2' curb and gutter both sides.

FIGURE A



(B) *Type 1 Local Streets.* These streets provide access for service vehicles and access to adjacent land use. Type 1 Local Streets should predominantly carry traffic having either a destination or origin on the street itself.

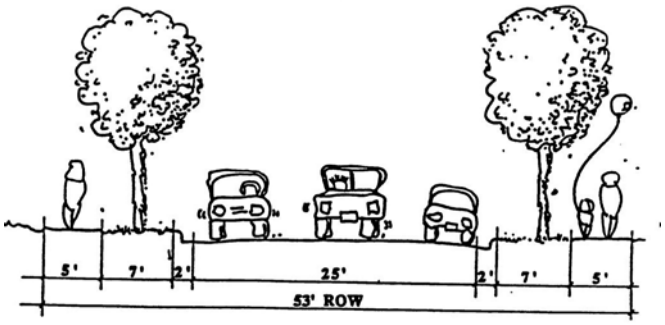
a. Land Use: Single family, two family, bungalow court.

b. Specifications:

53' ROW.	One 7' unmarked parking lane.
Two 5' sidewalks.	20' curb radii.
Two 7' parkways.	20 mph posted speed.
Two 9' general use lanes.	2' curb and gutter both sides.

c. On-street parking is optional if the pavement width is reduced to 18' (two 9' general use lanes) and right-of-way (ROW) reduced accordingly.

FIGURE B



(C) *Type 2 Local Streets*. These streets provide access for service vehicles and access to adjacent land use. The Type 2 Local Street may carry a small amount of residential through traffic generated from other local streets and lanes.

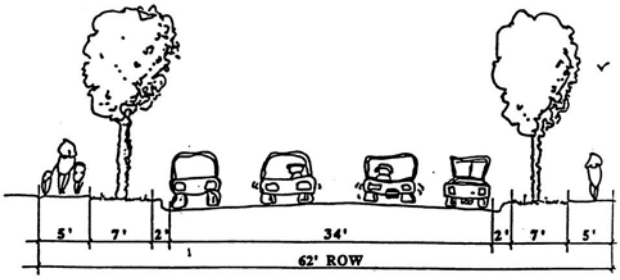
a. Land Use: Single family, two family, bungalow court, multifamily, rowhouses.

b. Specifications:

62' ROW.	Two 7' marked parking lanes.
Two 5' sidewalks.	20' curb radii.
Two 7' parkways.	25 mph posted speed.
Two 10' general use lanes.	2' curb and gutter both sides.

c. The parking lanes on Type B Local Streets should be striped.

FIGURE C



(D) *Town or Village Center Street*. These streets provide access for businesses and access to properties and to parking areas. Widths and radii should be increased as necessary if transit is to be accommodated.

a. Land Use: Town or Village Center.

b. Specifications:

(1) Option 1:

58' ROW.
Two 10' sidewalks.
Two 10' general use lanes.
Two 7' marked parking lanes.
25' curb radii.
25 mph posted speed.
2' curb & gutter both sides.

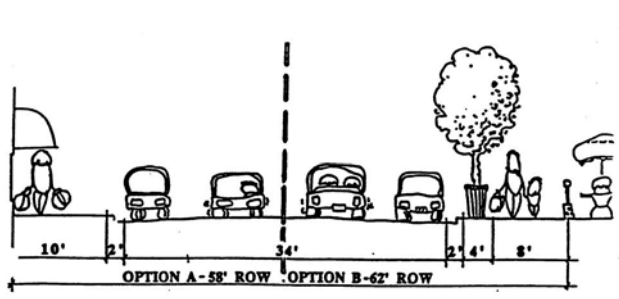
(2) Option 2:

62' ROW.
Two 8' sidewalks.
Two 10' general use lanes.
Two 4' planting strips.
Two 7' marked parking lanes.
25' curb radii.
25 mph posted speed.
2' curb & gutter both sides.

c. *Village Center Streets* should be striped to denote a no passing zone.

d. Bulbouts are required at intersections. Mid-block bulbouts are recommended on longer blocks.

FIGURE D



(E) *Residential Boulevard*. These Boulevards are similar to *Type 1 & 2 Local Streets* and *Village Center Streets*, depending upon adjacent land use. The distinction between the *Residential Boulevard* and the other streets is the inclusion of a landscaped median.

a. Land Use: Single family, two family, bungalow court, multifamily, Village Center.

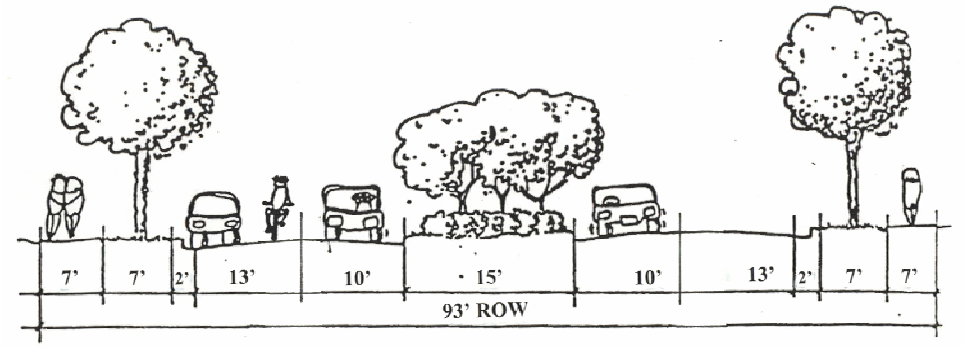
b. Specifications:

93' ROW.
Two 7' sidewalks.
Two 7' parkways.
Two 10' general use lanes.
Two 6′ bicycle lanes.
Two 7' marked parking lanes.
15' raised median with straight curbs or with gutter.
20' curb radii.
25 mph posted speed.
2' curb and gutter both sides.

c. Option without on-street parking: pavement width is reduced to 30' (two 10' general use lanes, two 5′ bicycle lanes and raised 15′ median) and right-of-way (ROW) is reduced accordingly.

d. Bulb-outs are required at intersections where on-street parking is provided.

FIGURE E



(F) *Alley*. The purpose of an alley is to provide a secondary means of access to lots and off-street parking at the rear of lots. The alley should not provide access for service vehicles.

a. Land Use: All land uses.

b. Specifications:

16' ROW.
One 8' lane, one-way.
Two 4' usable buffers.
10' radii.

(G) *Cul-de-Sac*. The purpose of a cul-de-sac is to provide access for service vehicles and access to lower density land uses and to allow flexibility in the design of cross sections.

a. Land Use: Single family, two family, bungalow court.

b. Specifications:

(1) Option 1 (aligns with *Lane*):

32' radius ROW.	15 mph posted speed.
30' radius paved area.	2' curb and gutter.

(2) Option 2 (aligns with *Local*):

52' radius ROW.	20' paved general use lane.
5' sidewalk.	15 mph posted speed.
25' radius center landscaped island with curbs.	2' curb and gutter.

c. Cul-de-sacs should be on street segments no longer than 500'.

d. A 7' parkway is optional; ROW should be increased accordingly.

e. Consider providing pedestrian connections between cul de sacs and adjacent streets.

Relation of Buildings to Streets and Parking.

(a) Orientation. Primary facades should contain the primary entry and should be street-facing. The principle orientation of the front facade of all buildings should be parallel to the streets they face. Where public parks are located across a street, the front facade should face the public park. Rear yards should not occur along local or connector streets.

Baldwin Park

(b) Homes Adjacent to Parkways and Arterial Streets. Where residential areas abut parkways and arterial streets, lotting and home placement should address these major streets in one of three ways:

1. homes front onto these streets with larger front setbacks and alley-accessed garages;

2. a frontage road is built adjacent to the major street right-of-way that provides a landscaped, "slow-traffic" local street for homes to front onto; or

3. cul-de-sac streets intersect with the major street with an opening or gated entry for pedestrians; homes may have side yards facing onto the major street.

(c) Primary Entry and Porches. With the exception of four-plexes, apartments, and accessory dwelling units, every home should have its primary entry (front door) facing a public street and not more than 6 feet recessed back from the face of the primary facade. Four-plexes and apartments may have their primary entry facing a central, landscaped courtyard. Ancillary units may face an internal walkway, driveway, or alley. Porches for all residential types should be accessed directly from a public street or pedestrian easement and must be visible from the street. It is suggested that porches extend 6 feet into the setback. Front porches should have a minimum depth of six feet and comprise a minimum of 30% of the width of a building's primary front facade (not including the garage) or 10 feet whichever is larger. Porches for duplexes, condos, and apartments may be shared. Tunnel-like entrances should be discouraged.

Baldwin Park

Celebration

(d) Garages. Residential streetscapes should not be dominated by garages. Garage frontage should also be limited for single family houses, duplexes and townhomes; garages should not comprise more than 25% of a building's street facing frontage (except on alleys).

1. Garages for Estate Residential, Large-Lot Single Family, Standard-Lot Single Family, Small-Lot Single Family, and Duplex types should be provided in one of two ways:

a. attached and recessed from the primary facade (not including porches, bays, or other minor projections) by a minimum of 8 feet and at least 24 feet from the street right-of-way; or

b. attached or detached, placed at the rear property line, and accessed by either an alley or a side yard driveway. In each development of single family houses and/or duplexes, no more than 50% of the units may have a recessed, front-loaded garage.

2. Garages for Townhouse and Apartment types may be either:

a. attached or detached, placed at the rear property line, and accessed by an alley or side yard driveway; or

b. for apartments, carports or garages may be grouped together and placed behind buildings.

Front Setbacks.
Front setbacks are measured from the right-of-way line of the adjacent street. Side yard and rear yard setbacks are measured from the property line.

Figure 68-F

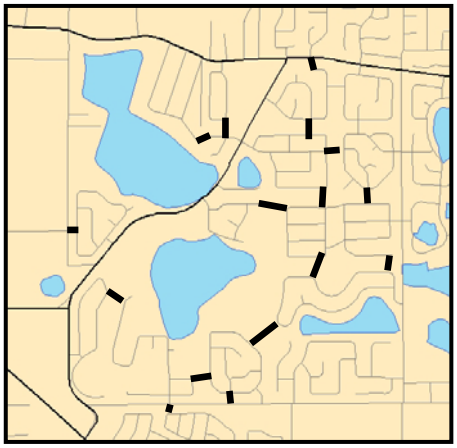
Front Setback	Town Center	Village Center	Neighborhood & Residential Center*	Residential Neighborhood	Estate Residential
Minimum Front Setbacks	8 feet	10 feet	15 feet	15 feet	20 feet
Maximum Front Setbacks	12 feet	15 feet	30 feet	25 feet	n/a

* Residential buildings with ground floor retail must follow the setback standards identified in the Mixed Use Block Standards.

Suburban Retrofit Techniques

Connecting Cul de Sacs and Loops

Recognizing the desire to reduce cut-through motor vehicle traffic on local neighborhood streets, this higher node-to-link ratio can be applied only to the pedestrian and bicycle system by making path connections between cul de sacs and loops and between subdivisions (map below). This strategy can be applied both to new and existing development. For existing developments, jurisdictions should consider identifying key properties that can provide such connections, and offer to purchase them as they come up for sale. The jurisdiction can then create the path connection and sell the property.



Using the example from Page 3 and adding walk and bike connections between loops, cul de sacs and subdivisions...

Centerline Miles increase from 34.5 to 36
Number of Links increases from 323 to 339
Number of Nodes increases from – 129 to 148
Ratio Nodes to Links increases from – 0.40 to 0.43
Centerline Miles per Sq. Mile increases from 13.8 to 14.4
Nodes per Square Mile increases from 51.6 to 59.2

Incentives

Expedited Permitting

Fast-tracking permits for projects that meet an alternative building code can help offset the high costs of infill and also help promote densification where it is desired. Projects that increase density often have the opposite problem – permitting delays due to controversy over higher densities.

Impact Fee Credits

Infill costs in urban areas can be an impediment to accomplishing the density and mix of uses that are necessary to support walking and bicycling. Reduced impact fees offset the higher costs of urban infill and redevelopment. Communities can reduce impact fees for development according to the reduction of vehicle trips per household or vehicle miles of travel expected from the development pattern planned for the district.

One area that varies transportation impact fees to reinforce alternative modes of transportation is the City of Bellevue, Washington. Bellevue varies impact fees depending upon the location and type of development (sometimes as much as 100%), with much lower fees in the downtown area based on its high level of transit service. The City of Portland, Oregon discounts impact fees (called system development charges or SDCs) for "transit-oriented" developments and also applies SDC revenues to transportation capital improvement projects that advance multimodal transportation objectives over a 10-year period. Qualifying criteria for eligibility for SDC expenditures of relevance to Florida Multi-modal Transportation Districts include:

- accommodates increased density and/or in-fill re/development,
- reduces reliance on automobile usage by increasing access to alternate modes of travel,
- improves transit connections between employment centers and neighborhoods, and
- limits impacts of motor vehicles on pedestrian, bike, and transit-oriented areas.

Other incentives that can be explored are community redevelopment areas/tax increment financing districts and publicly funded improvements to area infrastructure and streetscapes. In addition, some states, including Rhode Island, New Jersey, and Maryland, have enacted Rehab Codes as a means of reducing costs associated with revitalizing older buildings in urbanized areas. Rhode Island's Rehab Code, which went into effect in May 2002, is a streamlined and user-friendly document that reduces the time, expense and unpredictability of revitalizing older buildings for residential, commercial and industrial uses.

The Puget Sound Regional Council also notes the following effective incentives for transit-oriented developments:

- Density bonuses for projects that include a certain percentage of affordable housing units. In this way, communities can help preserve affordable housing alternatives and socio-economic diversity in multimodal districts, given the tendency of such areas to gentrify with a corresponding increase in housing prices.
- Expedited development applications in exchange

Floor Area Ratio Incentives

Some jurisdictions offer increased Floor Area Ratios (FAR) to developers that provide shower and locker facilities for bicycle commuters. One example is Portland, OR:

> Planning & Zoning Code - title 33; Central City Plan District 33.510.210
>
> 8. Locker room bonus option. To encourage bicycling, projects in the CX and EX zones outside of the South Waterfront Subdistrict that provide locker room facilities and extra long-term bicycle parking receive bonus floor area.
>
> For each square foot of area developed and committed to locker room facilities, a bonus of 40 square feet of additional floor area is earned. To qualify for the bonus, the following must be met:
>
> a. The locker room facility must include showers, a dressing area, and lockers;
>
> b. All tenants of the building must be able to use the locker room facility; and
>
> c. At least 110 percent of the required long-term bicycle parking for the site must be provided and must meet the standards of 33.266.220.B., Long- term Bicycle Parking.

Maximum and Minimum Number of Auto Parking Spaces

Each additional off-street surface parking space increases the distances between destinations. This is particularly discouraging to pedestrians, who are the most sensitive to increases in trip distance. At the same time, ample free parking encourages people to drive when other modes might be feasible. In addition to the conventional minimum parking space requirement, local governments can set a maximum limit to parking spaces. For developers who wish to exceed the maximum parking limit, a bonus program can be provided in which they can pay for the additional spaces. Conversely, Traffic Impact Fees can be discounted for developers who provide bicycle parking, provide less than the maximum number of auto spaces, and make other improvements to encourage walking, transit and bicycle use. Nearby on-street parking spaces can be counted toward the fulfillment of minimum parking requirements.

Example: City of Orlando Parking Requirements

Sec. 61.402. Parking Requirements.

(A) Number of Spaces. All uses within the Downtown Parking Area should provide parking spaces in accordance with the following:

(1) Residential Uses.

(a) Minimum: See Figure 18.

(b) Maximum without Parking Bonus: Two (2.0) parking spaces per dwelling unit.

(c) Maximum with Parking Bonus: None.

(2) Non-Residential Uses.

(a) Minimum: One (1.0) parking space per 1,000 sq. ft. of gross floor area (GFA).

(b) Maximum without Parking Bonus: Three (3.0) parking spaces per 1,000 sq. ft., GFA.

(c) Maximum with Parking Bonus: None.

(3) Exempt Non-Residential Uses. The following non-residential uses are exempt from the minimum parking requirements provided in (A)(2)(a) above:

(a) Retail Uses.

(b) Personal and Entertainment Uses.

(c) Theaters.

(d) Eating and Drinking Establishments.

(e) Child Care Centers.

(f) Hotel and Motel.

(g) Public Benefit Uses.

(B) Parking Bonus.

(1) Definition. For purposes of this Part, "Parking Bonus" should mean authorization given by the City to a landowner to provide parking spaces in excess of the maximum requirements set forth in (A) above, in exchange for a payment.

(2) Purpose. The Parking Bonus system is established to further the following objectives:

(a) Ensure that uses and proposed uses in the Downtown Parking Area are competitive in the local real estate market;

(b) Discourage the provision of parking spaces in excess of absolute need; and

(c) Ensure that off-street parking spaces are available for use by Downtown Parking Area residents and the general public.

(3) Bonus Payment. The total amount of a Parking Bonus payment should be calculated by multiplying the total number of parking spaces within each bonus range by the corresponding payment per space amount indicated in the tables below. For the purposes of this Part, gross floor area should only include interior spaces that are heated and/or air-conditioned.

Bonus Range For Residential Uses	Payment Per Space	
	West of I-4	East of I-4
0 to 2.0 spaces per dwelling unit	$0	$0
> 2.0 spaces per dwelling unit	$1,500	$1,500

Bonus Range For Non-Residential Uses	Payment Per Space	
	West of I-4	East of I-4
0 to 3.0 spaces per 1,000 sq. ft. GFA	$0	$0
> 3.0 spaces per 1,000 sq. ft. GFA	$0	$1,500

(4) Allocation. Bonus parking spaces may be provided either on-site or off-site in the Program. Bonus parking spaces provided in the Program should be subject to both the Parking Bonus payment, as described in (B)(2), above, and the payment to the Trust Fund for spaces in the Program, as described in Section 61.404.

(5) Designation. Prior to issuance of a building permit, the applicant should present to the City Planning and Development Department a written document which:

(a) Identifies the total number of parking spaces to be provided on-site and the total number of parking spaces to be provided in the Program; and

(b) Separately identifies the Bonus parking spaces to be provided on-site

Reducing Minimum Auto Parking Space Requirement in Return for Increased Bicycle Parking

Denver, CO:

"…bicycle parking spaces shall be provided equal to five (5) percent of the automobile parking space requirement."

"…required automobile parking spaces may be reduced at the ratio of one (1) automobile parking space for each six (6) bicycle parking spaces provided, except that

under no circumstances may the required number be reduced by more than five (5) percent."

Gainesville, FL

"…development review board or the city manager or his or her designee may allow the substitution of bicycle parking facilities, in addition to the minimum number of required bicycle parking facilities, for vehicle parking spaces on a three-for-one basis. Such substitution shall be made upon presentation of evidence by the owner of the property that the proposed use will be better served through the provision of additional bicycle facilities. In no instance shall the number of vehicle parking spaces provided be reduced by substitution of bicycle parking facilities to less than 85 percent of the requirements of this section."

Charlotte, NC:

The City of Charlotte, NC offers many types of density bonuses in their Transit Oriented Development District (Chapter 9) and their Pedestrian Overlay District (Chapter 10).
http://www.ci.charlotte.nc.us/Departments/Planning/Rezoning/City+Rezoning+Ordinance.htm .

Going Further

Drive-Through Services

Drive-throughs not only encourage trips by auto that might be conducted by walking or bicycling, but the extra space required decreases pedestrian-friendly densities, idling vehicles concentrate pollutants around the business, and conflicts are increased between drive-through users and pedestrians. The City of San Luis Obispo, CA prohibits drive-through facilities in all city zones (City of San Luis Obispo Zoning Regulations; Chapter 17.22: Use Regulation).

The City of Palo Alto, CA only allows drive-through services in their Community Commercial Districts if such services provide full access to pedestrians and bicyclists, permits no more than two drive-ins within 1,000 feet, and prohibits drive-ins from being less than 150 feet from one another.

Off-Street Motor Vehicle and Bicycle Parking Requirements

Based on Palo Alto, CA

Bicycle Parking Classes (see pages 22 through 24)

Class I: intended for long-term parking. Examples: bike lockers, covered locked cages, special locked room

Class II: intended for short term parking; bicycle racks.

Use	Minimum Off-Street Auto Parking Requirement	Minimum Bicycle Parking Requirement	Class
Administrative office services	1 space for each 250 sq. ft. of gross floor area	10% of auto parking	80% – I 20% – II
Business and trade schools	1 space for each 4-person capacity, or 1 space for each 250 sq. ft. of gross floor area, whichever is greater	10% of auto parking	40% – I 60% – II, covered
Churches and religious institutions	1 space for each 4 seats or 4-person capacity, based on maximum use of all facilities at the same time	10% of auto parking	20% – I 80% – II
Commercial recreation	1 space for each 4 seats or 4-person capacity, or as adjusted by the Zoning Administrator as part of the conditional use permit, not to exceed a 30% reduction	25% of auto parking	20% – I 80% – II, or as adjusted by Zoning Admin.
Community facilities (such as swim club, tennis club, golf course, community center, and similar facilities)	1 space for each 4 seats or 4-person capacity, or as adjusted by the Zoning Administrator as part of the conditional use permit, not to exceed a 30% reduction	25% of auto parking	20% – I 80% – II, or as adjusted by Zoning Admin.
Convalescent facilities	1 space for each 2.5 patient beds	10% of auto parking	2 spaces – I Remainder – II
Day care centers	1 space for each 1.5 employees	25% of auto parking	20% – I 80% – II
Eating and drinking services	1 space for each 60 sq. ft. of public service area, plus 1 space for each 200 sq. ft. other areas	10% of auto parking	40% – I 60% – II
Eating and drinking services with drive-in/take-out facilities	3 spaces for each 100 sq. ft. of gross floor area	25% of auto parking	40% – I 60% – II
Banks and other financial services	1 space for each 250 sq. ft. gross floor area	10% of auto parking	40% – I 60% – II
General business services	1 space for each 350 sq. ft. gross floor area	10% of auto parking	80% – I 20% – II
Hospitals	1 space for each 1.5 patient beds	10% of auto parking	60% – I 40% – II
Hotel	1 space per guest room, (plus applicable requirements for other uses, minus 75% of spaces required for guest rooms)	10% of auto parking	40% – I 60% – II

Off-Street Motor Vehicle and Bicycle Parking Requirements (continued)

Use	Minimum Off-Street Auto Parking Requirement	Minimum Bicycle Parking Requirement	Class
Lodging	1 space per guest room, (plus applicable requirements for other uses)	10% of auto parking	100% -- I
Manufacturing	1 space for each 300 sq. ft. gross floor area	10% of auto parking	90% -- I 10% -- II
Medical, professional, and general business offices	1 space for each 250 sq. ft. gross floor area	10% of auto parking	60% -- I 40% -- II
Multi-family residential (resident)		1 space per unit	100% -- I
Multi-family residential (guest)		1 space per 10 units	100% -- II
Private clubs, lodges and fraternal organizations	1 space for every 4 seats or 4-person capacity based on maximum use of all space at one time	10% of auto parking	20% -- I 80% -- II
Research and development	1 space for each 250 sq. ft. gross floor area	10% of auto parking	80% -- I 20% -- II
Retail	1 space for each 200 sq. ft. gross floor area	10% of auto parking	20% -- I 80% -- II
Schools			
Grades K thru 8	2 spaces per teaching station	1 space per every three students	10% -- I (staff) 90% -- II (students)
Grades 9 thru 12	4 spaces per teaching station	1 space per every three students	10% -- I (staff) 90% -- II (students)
Shopping center	1 space for each 275 sq. ft. gross floor area	10% of auto parking	40% -- I 60% -- II
Warehousing and distribution	1 space for each 1,000 sq. ft. gross floor area	10% of auto parking	80% -- I 20% -- II
Any use not specified	To be determined by Director of Planning & Community Development	To be determined	To be determined

Bicycle Parking Design Standards (based on City of Palo Alto, CA; Denver, CO):

(A) Classifications of Bicycle Parking Facilities.

(1) Class I Facilities. Intended for long-term parking; protects against theft of entire bicycle and of its components and accessories. The facility must also protect the bicycle from inclement weather, including wind-driven rain. Three design alternatives for Class I facilities are as follows:

(a) Bicycle Locker. A fully enclosed space accessible only by the owner or operator of the bicycle. Bicycle lockers may be pre-manufactured or designed for individual sites. All bicycle lockers must be fitted with key locking mechanisms.

For sample illustrations of bicycle parking equipment, see METROPLAN ORLANDO's *Providing Quality Bicycle Parking*

In multiple-family developments, the Class I bicycle parking and required storage area for each dwelling unit may be combined into one locked multi-use storage facility provided that the total space requirement should be the sum of the requirements for each use computed separately.

The preferred Class I facility is a bicycle locker. Restricted access facilities and enclosed cages may be considered as alternatives to bicycle lockers as indicated below. Class I facilities other than lockers, restricted access rooms, or enclosed cages, but providing the same level of security, may be approved by the Director of Planning and community Environment.

(b) Restricted Access. Class II bicycle parking facilities located within a locked room or locked enclosure accessible only to the owners or operators of the bicycles parked within. The maximum capacity of each restricted room or enclosure should be ten (10) bicycles. An additional locked room or enclosure is required for each maximum increment of ten additional bicycles. The doors of such restricted access enclosures must be fitted with key locking mechanisms.

In multiple-family residential developments, a common locked garage area with Class II bicycle parking facilities should be deemed restricted access provided the garage is accessible only to the residents of the units for whom the garage is provided.

(c) Enclosed Cages. A fully enclosed chain link enclosure for individual bicycles, where contents are visible from the outside, and which can be locked by a user-provided lock. The locking mechanism must accept a 3/8" diameter padlock. This type of facility is only to be used for retail and service uses and multiple family developments.

(2) Class II Facilities. Intended for short-term parking. A stationary object to which the user can lock the frame and both wheels with a user-provided cable or chain (6 foot) and lock. The preferred facility is an inverted "U" bicycle rack.

> The "Inverted U" is especially recommended as a standard for jurisdictions without a designated bicycle coordinator or planner. Planners and building inspectors without significant bicycle facility design experience do not usually have the expertise in discerning good bicycle racks from marginal or poor ones. The "Inverted U" standard makes the planner's or building inspector's job simpler and guarantees a quality Class II bicycle parking facility.

(a) Description - The "Inverted U" Type Bicycle Rack (source: City of Denver, CO)

The Inverted U's shall be fabricated from 1 ½" Schedule 40 Pipe, in accordance with ASTM F 1083, 48.26 mm O.D. x 3.683 mm wall (1.90" x 0.145" wall). The U's shall measure 914.4 mm high x 457.2 mm wide (36" high, 18" wide). The bicycle racks shall not be welded in sections. Only the base plate shall be welded to the steel pipe with two (2) 3mm (1/8") vent holes - one on the inside of each upright where the pipe is welded to the baseplate. After fabrication, the rack shall be coated with a Thermoplastic (polyethylene copolymer based) powder coating (polyarmor) to a thickness 200-250 micrometers (8 - 12 mils). Racks shall be mounted to concrete via 190 mm (7 ½") diameter baseplates 10mm (3/8") thick steel in accordance with ASTM A 36, with three 11 mm diameter (7/16") mounting holes on each base plate, spaced equidistant between the upright pipe and edge of the baseplate. Expansion anchor to be carbon steel mushroom head, 10 mm x 76 mm (3/8" x 3") "spike" #5550 as manufactured by Rawl or approved equal manufactured in the U.S. made from grade 8.2 materials exhibiting equivalent theft-proof performance. Racks shall be set firm and aligned with a tolerance of plus or minus ¼" from plumb. Where required, steel tapered shims shall be installed prior to anchoring in place. Any departure of base plate from grade by more than 3/8" shall require the separation to be filled with high-strength epoxy non-shrinking grout and made level.

"Inverted U" (Baserail Array) Alternate.

Inverted U bike racks shall consist of two to five inverted U's as specified above, mounted 30" on-center via baseplate rails. Racks shall be mounted to concrete via baseplate rails 12.7 mm x 76.2 mm (1/2" x 3") steel in accordance with ASTM A 36 to create a free-standing array.

Only the base rails shall be welded to the steel pipe. The baserails shall have 11 mm diameter (7/16") mounting holes located as shown on the city bicycle rack details (mounted via the same expansion anchors as described above.)

(b) All Class III facilities must be located at street floor level.

(3) The following general design standards should be observed (Palo Alto, CA):

(a) Facilities designed for hanging or vertical storage of bicycles do not satisfy the requirements of this chapter.

(b) Paving of bicycle parking areas is required.

(c) Class II facilities should provide at least a twenty-four inch clearance from the centerline of each adjacent bicycle, and at least eighteen inches from walls or other obstructions.

(d) An aisle or other space should be provided to bicycles to enter and leave the facility. This aisle should have a width of at least five feet (1.5 meters) to the front or the rear of a standard six-foot (1. 8 meters) bicycle parked in the facility.

(e) Parking facilities should support bicycles in a stable position without damage to wheels, frame, or component.

(f) Bicycle parking should be situated at least as conveniently as the most convenient non-ADA motor vehicle parking area. Bicycle and motor vehicle parking areas should be separated by a physical barrier or sufficient distance to protect parked bicycles from damage by motor vehicles.

(g) Class I facilities at employment sites should be located near the building entrances used by employees.

(h) Class II facilities intended for customers or visitors should be located near the main building entrances used by the public.

(i) Convenient access to bicycle parking facilities should be provided. Where access is via a sidewalk or pathway, curb ramps should be installed where appropriate. Users should not be required to use steps to access bicycle parking facilities.

(j) Lighting should be provided in all bicycle parking areas. In both exterior and interior locations, lighting of not less than one footcandle of illumination at ground level should be provided. .

(k) The director of planning and community environment should have the authority to review the design of all bicycle parking facilities required by this chapter with respect to safety, security, and convenience.

(4) Signage of Bicycle Parking Facilities.

(a) Where bicycle parking areas are not clearly visible to approaching bicyclists, signs should be posted to direct cyclists to the facilities. [Signs should be D4-3 from MUTCD.]

(b) All bicycle parking areas should be identified by a sign of a minimum of 12" x 12" in size to identify the area for bicycle parking and to give the name, phone number or location of the person in charge of the facility.

(c) Where Class I parking required by this chapter is provided by restricted access parking, the sign should state that the bicycle enclosure should be kept locked at all times.

Municipalities with full-time bicycle coordinators may wish to develop a list of suppliers who provide bicycle racks and lockers that meet the city's codes. Such a list might include the type of rack, unit costs, a security rating, and bicycle capacity. Such a list will require regular updating, but will allow builders greater flexibility in selecting racks while at the same time ensuring that installed racks are effective.

Employee Shower Facility Requirements

Based on Palo Alto, CA

"Employee shower facilities should be provided for any new building constructed, and for any addition or enlargement of an existing building or use in compliance with the following table."

Use	Gross Floor Area of New Construction	Number of Showers Required
Medical, professional, general business offices, financial services, business and trade schools, general business services, research and development, and manufacturing	0 – 9,999 square feet	No requirement
	10,000 – 19,999 square feet	1
	20,000 – 49,999 square feet	2
	50,000 square feet and up	4
Retail, personal and eating and drinking services	0 – 24,999 square feet	No requirement
	25,000 – 49,999 square feet	1
	50,000 – 99,999 square feet	2
	100,000 square feet and up	4

Best Practices Design Resources

(Italicized items included on Metroplan Orlando Bicycle & Pedestrian Best Practices Guide CD)

General

Model Ordinances for the Enhancement of Bicycle and Pedestrian Access to Transportation Facilities – from 20-Year Bicycle & Pedestrian Access Master Plan -- Maryland DOT

Land Use and Transportation Network Relationship

Multimodal Transportation Districts and Areawide Quality of Service Handbook -- FDOT

Model Regulations and Plan Amendments for Multimodal Transportation Districts – Developed for FDOT by the Center for Urban Transportation Research (University of South Florida)

Street Networks

Traditional Neighborhood Development: Will the Traffic Work? -- Presentation by Walter Kulash at the 11th Annual Pedestrian Conference in Bellevue WA, October 1990.

Neighborhood Connectivity: Literature Review & Case Studies – FDOT District 4

Pedestrian Facility Design

FDOT Pedestrian Planning & Design Handbook

Guide for the Development of Pedestrian Facilities (soon to be released) – American Association of State Highway and Transportation Officials (AASHTO)

Designing Sidewalks and Trails for Access: Parts I, II & III – Federal Highway Administration

Improving Conditions for Bicycling and Walking -- Association of Pedestrian and Bicycle Professionals (APBP)

Central Florida Mobility Design Manual – LYNX

Customer Amenities Manual -- LYNX

Bicycle Facility Design

FDOT Bicycle Planning & Design Handbook

Guide for the Development of Bicycle Facilities – American Association of State Highway and Transportation Officials (AASHTO)

Improving Conditions for Bicycling and Walking -- Association of Pedestrian and Bicycle Professionals (APBP)

Bicycle Parking

Providing Quality Bicycle Parking -- METROPLAN ORLANDO

Bicycle Parking Guidelines -- Association of Pedestrian and Bicycle Professionals (APBP)

End-of-Trip Bicycle Facilities Guide -- Broward County MPO

Motor Vehicle Parking

Parking Alternatives: Making Way for Urban Infill and Brownfields Redevelopment -- Urban and Economic Development Division, U.S. Environmental Protection Agency

The Trouble With Minimum Parking Requirements – Victoria Transport Policy Institute

Suburban Retrofit

Transforming Suburban Business Districts – Urban Land Institute