

TRANSIT-ORIENTED DEVELOPMENT

SMARTCODE MODULE

PREPARED BY HANK DITTMAR AND LAURA PINZON, THE PRINCE'S FOUNDATION FOR THE
BUILT ENVIRONMENT, WITH THE CENTER FOR TRANSIT-ORIENTED DEVELOPMENT

If they'd lower the taxes and get rid of the smog and clean up the traffic mess, I really believe I'd settle here until the next earthquake.

Groucho Marx

TRANSIT-ORIENTED DEVELOPMENT
SMARTCODE MODULE

This TOD Module is transect-based. All or part of it may be adopted with a customized SmartCode as regulatory, advisory, or merely permissive ("shall," "should" or "may") or it may be provided as an auxiliary set of guidelines for developers and/or municipalities. Any mandatory regulations must be activated by the sections on the facing page or similar language. Even advisory or permissive standards are more likely to be used if they are activated by text within the code.

If any part of this Module is used, the appropriate definitions should be added to Article 7 during calibration.

ARTICLE 3. NEW COMMUNITY PLANS
3.7 THOROUGHFARE STANDARDS

If the Table TOD-1 is to be mandatory or advisory for New Community Plans (the public realm), it should be activated using this or similar language in the code text. The word "shall" may be replaced with "should" if the table is merely advisory. Other standards may be added.

The Existing Thoroughfares Module is helpful for codes that apply only to already urbanized areas, i.e., the G-4 Infill Growth Sector and the G-5 Sprawl Repair Growth Sector. For such codes, the sections here may be correlated to that Module, and then into the final code.

Municipality

ARTICLE 3. NEW COMMUNITY PLANS
3.7 THOROUGHFARE STANDARDS

- 3.7.X TRANSIT
- x. A Transit network shall be provided throughout the community, allocated according to Table TOD-1 and designed according to the appropriate Transitway Assemblies for the Transect Zone..
- 3.7.3 PUBLIC FRONTAGES
- x. GENERAL TO ZONES T3, T4, T5, T6
 - x. Within the Public Frontages, Transit stops shall be allocated according to Table TOD-1.

TRANSIT-ORIENTED DEVELOPMENT

Transit-Oriented Development (TOD) is development where the lots are located approximately within a half mile of a rail or Bus Rapid Transit (BRT) station. A TOD typically has higher densities than such areas without transit, to support increased amounts of retail and services as well as ridership. Automobile parking should be significantly reduced and bicycle parking increased in TODs. See the Bicycling Module.

The SmartCode applies a TOD overlay on the other Community Unit types, permitting a 30% density increase without an accompanying increase in parking requirements. This method ensures that the underlying pattern is not a monoculture, but is already transect-based with a choice of habitats. See Section 3.3.4 of the base code.

These annotations are advisory only. The SmartCode itself appears only on the right side of each spread.

TABLE TOD-1

This transect-based table summarizes several aspects of Transit-Oriented Development. It has subzones of T-4 and T-5 at different intensities for different levels of urbanization, i.e., different Community Unit types. This gives calibrators a head start on finer distinctions in a regional context. For example, the T-4 in Katonah, New York is less dense, with less mixed use, than the T-4 in Manhattan.

Land Use Mix: The T-3 Zone calls for retail at the station, which may be a corner store as permitted in the uncalibrated base code on Table 10, or a newsstand. If the retail type is more extensive than that, such as Neighborhood Shops or Main Street Shops, it would be zoned as a higher T-zone. See the Retail: Sustainable Commerce module.

Minimum Housing Density: The SmartCode has Base Residential Density associated with Transect Zones in the Summary Table of the base code, but household densities are controversial as criteria for transit mode selection. Actual transit system planning is much more complex. The numbers provided here are based on "origin" Transect Zones and typical situations; however, in many cases the "destination" zones are also factors. For example, Regional/Commuter Rail is appropriate at T-3 densities, but likely requires numerous stops and a T-6 destination. An origin station may also be a destination station if it is mixed use. One Regional/Commuter Rail line may stop in the T-5 zones of several towns and neighborhoods to collect riders for the ultimate destination, and there may be reverse commuting to those T-5 centers.

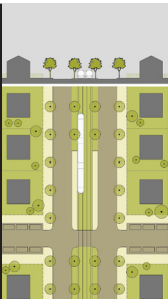
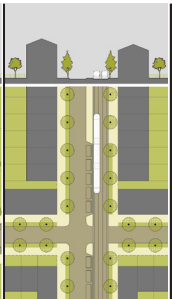
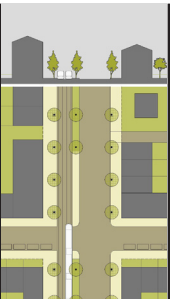
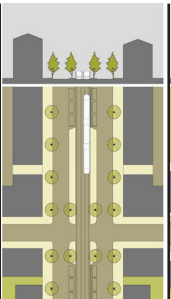
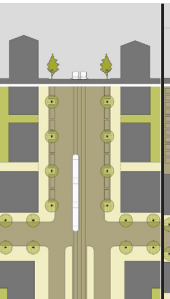

Transit Modes: See the Appendix of this Module for illustrated Transit Modes.

Examples: If this table is to be regulatory in a customized SmartCode, the examples should be moved into the annotations, or deleted. Examples and detailed illustrations or photographs are problematic in a legal document because a challenge may arise based on a too-literal reading of their characteristics.

If the table is merely advisory, including examples may be appropriate. This section of the table may be customized with local examples.

Municipality

TABLE TOD-1: Summary Table. This table allocates transit modes, their characteristics, and their typical contexts along the Transect.

						
	T3 SUB-URBAN ON TRANSIT CORRIDOR	T4 GENERAL URBAN IN COMMUTER TOWN	T4 GENERAL URBAN IN CITY	T5 URBAN CENTER / MAIN STREET IN COMMUTER TOWN	T5 URBAN CENTER / CORRIDOR IN CITY CENTER	T6 URBAN CORE IN CITY CENTER
Land Use Mix	Residential SFD Retail at stop/station	Residential mix local serving Retail local serving Office	Residential mix local serving Retail local serving Office	Multifamily housing Retail primary Office center	Multifamily housing Retail Office Education	Multifamily housing Retail primary Office center urban entertainment
Minimum Housing Density	>12 units / acre (>30 units / Ha)	>12 units / acre (>30 units / Ha)	>20 units / acre (>50 units / Ha)	>50 units / acre (>123 units / Ha)	>50 units / acre (>123 units / Ha)	>60 units / acre (>148 units / Ha)
Housing Types	Detached	Detached Semi-Detached Apartment Bldg. Rowhouse	Detached Semi-Detached Apartment Bldg. Rowhouse Loft Bldg.	Apartment Bldg. Rowhouse Loft Bldg.	Apartment Bldg. Loft Bldg.	Apartment Bldg. Loft Bldg.
Regional Connectivity	Medium Access to village or town center Access to city center	Medium Access to city center	Medium Access to city center Sub-regional circulation	High Access to city center Sub-regional hub	High Hub of regional connections	High Hub of radial system
Transit Modes	Light Rail Bus Rapid Transit Bus Transit Paratransit	Regional/Commuter rail Light Rail Bus Rapid Transit Bus Transit Paratransit	Light rail Streetcar / Tram Bus Rapid Transit Bus Transit	Regional/Commuter Rail Light Rail Streetcar / Tram Bus Rapid Transit Bus Transit Paratransit	Rail Rapid Transit/ Heavy Rail Regional/Commuter Rail Light Rail Streetcar / Tram Bus Rapid Transit Bus Transit	Priority: Streetcars, pedestrians, bicycles. Buses (outside core pedestrian centers)
Frequencies (peak hours) (off-peak)	5 to 10 minutes 10 to 15 minutes	5 to 10 minutes 10 to 15 minutes	5 - 8 minutes <10 minutes	<5 minutes <8 minutes	<5 minutes <8 minutes	<5 minutes <8 minutes
Distance Between Stops	1000 to 2000 feet (300m to 600m)	650 to 1800 feet (200m to 550m)	650 to 1800 feet (200m to 550m)	650 to 1650 feet (200m to 500m)	500 to 1650 feet (150m to 500m)	500 to 1300 feet (150m to 400m)
Examples	Crossings (Mountain View,CA) Ohlone-Chynoweth (San Jose, CA) Decines Centre (Lyon, France)	Prairie Crossing (Illinois) Suisun City (California) El Campello (Alicante, Spain) Pessac Centre (Bordeaux, France)	Villon Station (Lyon, France) Fullerton (Chicago, USA) Barrio Logan (San Diego, USA)	Arlington County (Virginia, USA) Addison Circle (Dallas, USA) Ettingen (Karlsruhe,Gemany) Avenue 8 du Mai (Grenoble, France)	Yamhill St, Portland (Oregon, USA) Central (Zurich,Switzerland) Parc du Contades (Strasbourg, France) Cours Charlemagne (Lyon, France) Centre Berthelot (Lyon, France)	Pioneer Square, Portland (Oregon, USA) Rue de la Division Leclerc, (Strasbourg,France) Printers Row (Chicago, USA) Bahnhofstrasse (Zurich,Switzeland) LoDo (Denver,USA)

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TABLE 4C. TRANSIT ASSEMBLIES FOR COMPLETE THOROUGHFARES

Included here are nine assemblies in the same format as the Table 4C Complete Thoroughfare Assemblies and the Bikeway Assemblies in the Bicycling Module. When engineering a Complete Thoroughfare, all three modules should be consulted, as well as the Light Imprint or Natural Drainage methods.

These assemblies are all drawn for Light Rail because that is the most complex mode to incorporate into a Complete Thoroughfare and is relatively new to the United States. The assemblies may be adapted for Bus Rapid Transit and Bus Transit.

Some of the walkways include bikeways that are commonly used in the UK and Europe as part of an integrated bikeway system. They are controversial; many US bicycle advocates consider them unsafe at intersections where car traffic turns, and statistics bear out that it is the most dangerous bikeway type. Where motor vehicles are present, cyclists should not use the pedestrian crossing for bicycle crossing unless they walk their bikes across, checking for turning traffic as pedestrians do.

PM-59-0-LR

Bikeways on sidewalks of pedestrian malls are generally safe for cyclists, as there would be no turning traffic from the mall. However, safety depends on cyclists obeying traffic signals at intersections.

The pavement width for pedestrian mall assemblies is 0 because "pavement" is used in the SmartCode Modules to include only travel and parking lanes for automobiles, or shared travel lanes for transit and automobiles. Depending on the bikeway included, the pavement may be suitable for bicycle travel as well. While in some regions the term "pavement" refers to the sidewalk, in these modules the sidewalk is categorized under Walkway Type.

AV-97-38-LRD

This assembly features a green (planted) railbed. In addition to natural drainage benefits, the train is quieter. Freiburg, Germany has made good use of this technique.

KEY

Thoroughfare Type

Right of Way Width

Pavement Width

Transportation

ST-57-20-BL

THOROUGHFARE TYPES

Highway: HW

Road: RD

Street: ST

Drive: DR

Avenue: AV

Commercial Street: CS

Boulevard: BV

Rear Alley: RA

Rear Lane: RL

Path: PT

Passage: PS

Pedestrian Mall: PM

TRANSITWAY TYPES

Rail Rapid Transit RRT

Commuter/Regional Rail CMR

Light Rail (Shared) LR

Light Rail (Dedicated) LRD

Light Rail (Separated) LRS

Streetcar / Trolley SCR

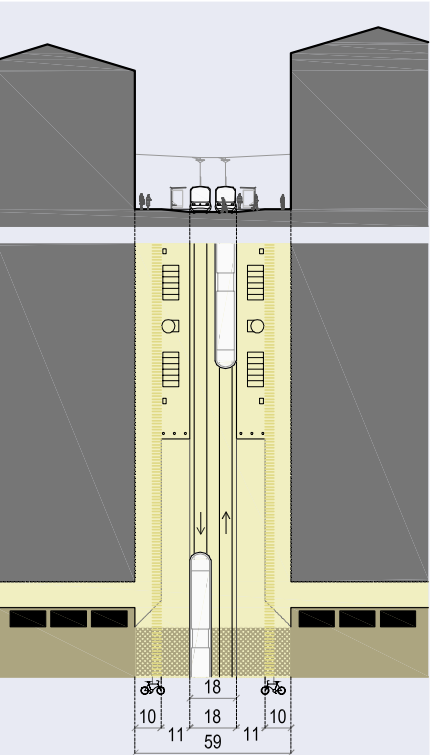
Bus Rapid Transit BRT

Bus Transit BST

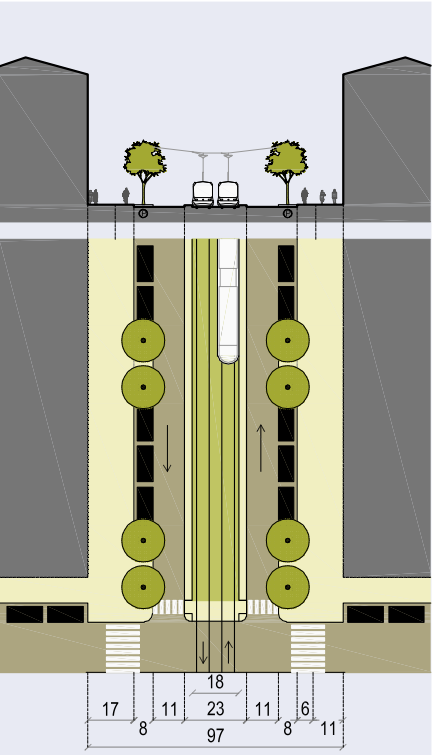
Paratransit PRT

BIKEWAY TYPES See Bicycling Module

ASSEMBLY DESIGNATION	
Thoroughfare Type	
Right-of-Way Width	
Pavement Width	
Transect Zone Assignment	
PUBLIC FRONTAGE	
Drainage Type	
Curb Radius	
Walkway Type	
Planter Type	
Landscape Type	
Median Width	
VEHICULAR LANES	
Traffic Lane Width	
Parking Lane Width	
Target Speed	
Pedestrian Crossing Time	
TRANSITWAY TYPE	
Transitway Width	
Stop Placement	
Surface Type	
Surface Level	
BIKEWAY TYPE	



PM-59-0-LR	
Pedestrian Mall	
59 feet	
18 feet for transit ROW	
T5, T6	
Curb for stops	
n/a	
59 ft shared surface	
n/a	
optional	
n/a	
n/a	
n/a	
n/a	
n/a	
n/a	
n/a	
n/a	
5.5 seconds	
Light Rail (Shared)	
18 ft	
existing pavement	
shared with bicycles and pedestrians	
same as bicycles and pedestrians	
Dedicated Walkway Track	



AV-97-38-LRD	
Avenue	
97 feet	
38 ft	
T4, T5	
Curb	
10 ft	
17 ft sidewalk each side	
7 ft (spaced parking)	
trees at 30' o.c. avg	
23 feet	
11 feet	
both sides @ 8 ft	
30 mph	
8 seconds	
Light Rail Dedicated	
18 ft	
Dedicated Pavement	
Dedicated within median (green railbed)	
same as cars	
See Bicycling Module	

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PAVEMENT WIDTH

If the transitway is not paved, as in the AV assembly on the facing page, the pavement width number is the sum of the automobile/bicycle travel and parking lanes only. Where the transitway is paved, whether dedicated or shared, the entire pavement width is counted in the assembly, as in the ST assembly on the facing page.

AV-88-24-LRD

This assembly features a green (planted) railbed. In addition to natural drainage benefits, the train is quieter.

<div><div>KEY</div><div><div>Thoroughfare Type</div><div>Right of Way Width</div><div>Pavement Width</div><div>Transportation</div></div><div>ST-57-20-BL</div></div>	
<div><div>THOROUGHFARE TYPES</div><div>Highway: HW</div><div>Road: RD</div><div>Street: ST</div><div>Drive: DR</div><div>Avenue: AV</div><div>Commercial Street: CS</div><div>Boulevard: BV</div><div>Rear Alley: RA</div><div>Rear Lane: RL</div><div>Path: PT</div><div>Passage: PS</div><div>Pedestrian Mall: PM</div><div>TRANSITWAY TYPES</div><div>Rail Rapid Transit: RRT</div><div>Commuter/Regional Rail: CMR</div><div>Light Rail (Shared): LR</div><div>Light Rail (Dedicated): LRD</div><div>Light Rail (Separated): LRS</div><div>Streetcar / Trolley: STC</div><div>Bus Rapid Transit: BRT</div><div>Bus Transit: BST</div><div>Paratransit: PRT</div><div>BIKEWAY TYPES See Bicycling Module</div></div>	
ASSEMBLY DESIGNATION	
Thoroughfare Type	
Right-of-Way Width	
Pavement Width	
Transect Zone Assignment	
PUBLIC FRONTAGE	
Drainage Type	
Curb Radius	
Walkway Type	
Planter Type	
Landscape Type	
Median Width	
VEHICULAR LANES	
Traffic Lane Width	
Parking Lane Width	
Target Speed	
Pedestrian Crossing Time	
TRANSITWAY TYPE	
Transitway Width	
Stop Placement	
Surface Type	
Surface Level	
BIKEWAY TYPE	

AV-88-24-LRD
Avenue
88 ft
24 ft
T2, T3, T4
Curb
10 feet
14 ft shared Sidewalk
7 ft continuous Planters
trees at 30' o.c. avg.
36 ft
12 feet
n/a
>35 mph
3.7 seconds 3.7 seconds
Light Rail (Dedicated)
18 ft
Dedicated Pavement
Dedicated within median (green railbed)
same as cars
See Bicycling Module

ST-74-55-STC
Street
74 ft
55 ft
T3, T4, T5
Curb
10 feet
10 ft Sidewalk
tree wells
trees at 30' o.c. avg.
n/a
11 feet
one side @ 8 ft
30 mph
15.7 seconds
Streetcar / Trolley
24 ft
existing pavement
shared
same as cars
See Bicycling Module

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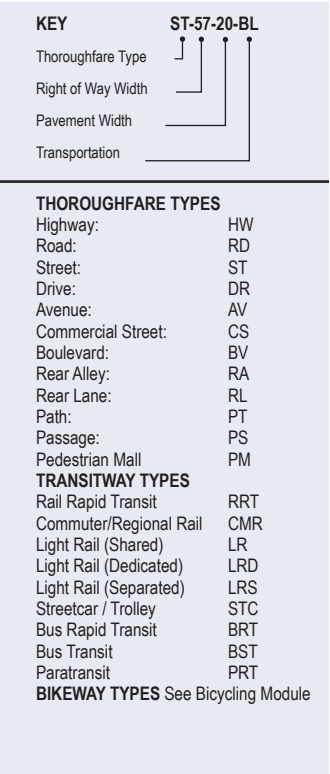
PAVEMENT WIDTH

If the transitway is not paved, as in the DR assembly on the facing page, the pavement width number is the sum of the automobile/bicycle travel and parking lanes only. Where the transitway is paved, whether dedicated or shared, the entire pavement width is counted in the assembly, as in the AV assembly on the facing page.

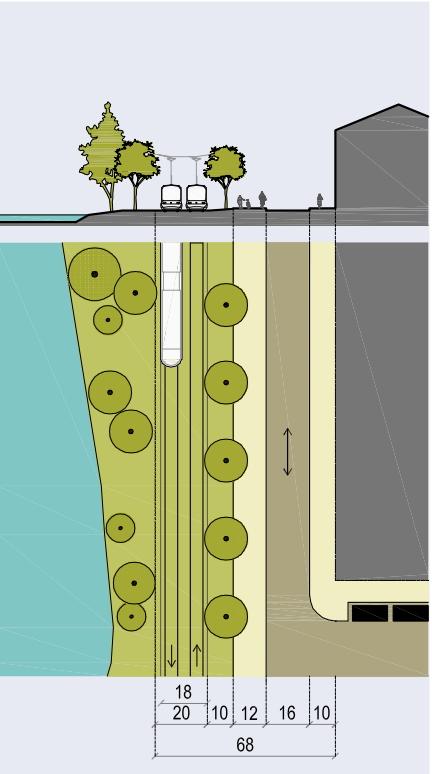
DR-68-16-LRS

This assembly features a green (planted) railbed. In addition to natural drainage benefits, the train is quieter.

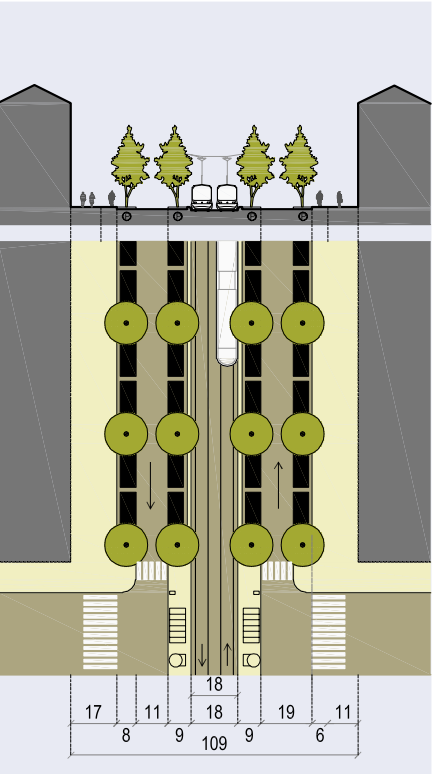
Municipality



ASSEMBLY DESIGNATION	
Thoroughfare Type	Drive
Right-of-Way Width	68 feet
Pavement Width	16 feet
Transect Zone Assignment	T3, T4, T5
PUBLIC FRONTAGE	
Drainage Type	Curb
Curb Radius	5 - 10 feet
Walkway Type	10 ft Sidewalk
Planter Type	7 ft continuous Planter
Landscape Type	Trees at 30' o.c. avg
Median Width	n/a
VEHICULAR LANES	
Traffic Lane Width	8 feet
Parking Lane Width	n/a
Target Speed	<20 mph
Pedestrian Crossing Time	4.6 seconds
TRANSITWAY TYPE	
Transitway Width	18 feet
Stop Placement	existing and Dedicated Pavement
Surface Type	Separated (Greenway and green railbed)
Surface Level	same as cars on cross streets
BIKEWAY TYPE	
See Bicycling Module	



DR-68-16-LRS	
Drive	
68 feet	
16 feet	
T3, T4, T5	
Curb	
5 - 10 feet	
10 ft Sidewalk	
7 ft continuous Planter	
Trees at 30' o.c. avg	
n/a	
8 feet	
n/a	
<20 mph	
4.6 seconds	
Light Rail (Shared)	
18 feet	
existing and Dedicated Pavement	
Separated (Greenway and green railbed)	
same as cars on cross streets	
See Bicycling Module	



AV-109-74-LRD	
Avenue	
109 feet	
74 feet	
T4, T5	
Curb	
5 - 10 ft	
11 ft Sidewalk	
tree wells	
Trees at 30' o.c. avg	
n/a	
11 feet	
8 feet	
30 mph	
3.4 seconds 10.2 seconds 3.4 seconds	
Light Rail (Dedicated)	
18 feet	
Dedicated Pavement	
Dedicated	
same as cars	
See Bicycling Module	

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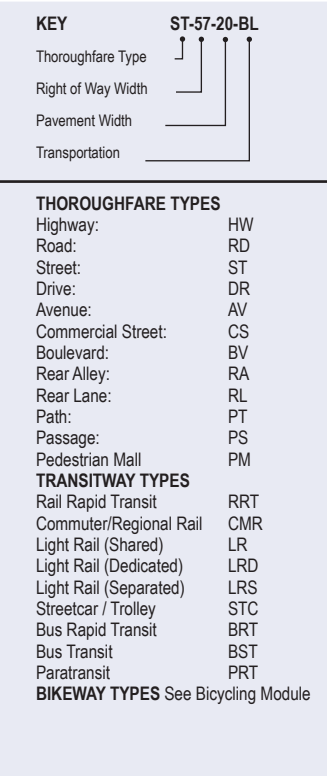
CS-52-27-LR

This assembly diagram has a break in the center to indicate that the loop is usually separated by a block or blocks. Therefore a pavement width of 27 feet is assigned in the table and Assembly Designation, not twice that.

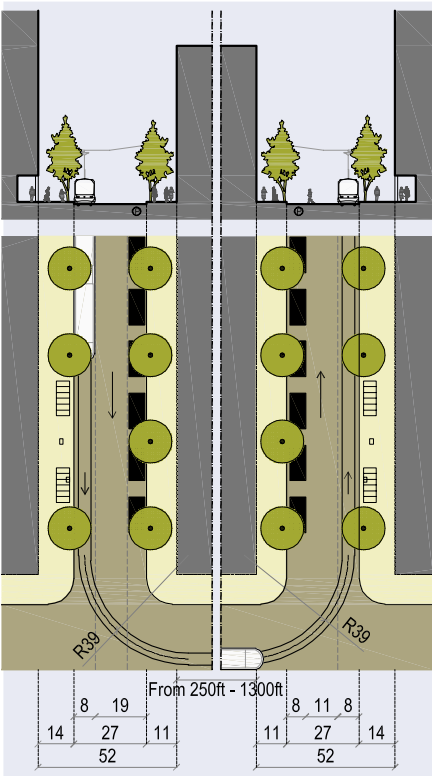
PM-66-0-LRD

Bikeways on sidewalks of pedestrian malls are generally safe for cyclists, as there would be no turning traffic from the mall. However, safety depends on cyclists obeying traffic signals at intersections.

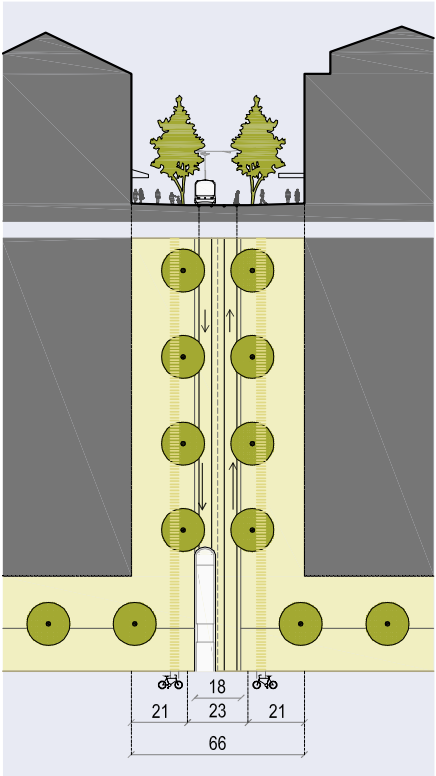
The pavement width for pedestrian mall assemblies is 0 because "pavement" is used in the SmartCode Modules to include only travel and parking lanes for automobiles and/or transit. Depending on the bikeway included, the pavement may be suitable for bicycle travel as well. While in some regions the term "pavement" refers to the sidewalk, in these modules the sidewalk is categorized under Walkway Type.



ASSEMBLY DESIGNATION	
Thoroughfare Type	
Right-of-Way Width	
Pavement Width	
Transect Zone Assignment	
PUBLIC FRONTAGE	
Drainage Type	
Curb Radius	
Walkway Type	
Planter Type	
Landscape Type	
Median Width	
VEHICULAR LANES	
Traffic Lane Width	
Parking Lane Width	
Target Speed	
Pedestrian Crossing Time	
TRANSITWAY TYPE	
Transitway Width	
Stop Placement	
Surface Type	
Surface Level	
BIKEWAY TYPE	



CS-52-27-LR	
Commercial Street (Loop)	
52 feet	
27 feet	
T5, T6	
Curb	
10 feet	
14 feet outer 11 feet inner Sidewalk	
tree wells	
trees at 30' o.c. avg	
n/a	
12 feet	
7 feet	
>35 mph	
7.7 seconds	
LIGHT RAIL (SHARED)	
8 feet	
existing pavement	
shared	
same as cars	
See Bicycling Module	



PM-66-0-LRD	
Pedestrian Mall	
66 feet	
23 feet for transit ROW	
T5, T6	
Curb	
n/a	
21 feet shared each side	
tree wells	
trees at 30' o.c. avg	
n/a	
n/a	
n/a	
n/a	
LIGHT RAIL (DEDICATED)	
18 feet	
existing pavement	
shared	
same as cars on cross streets	
Dedicated Walkway Track	

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Municipality

<div><div>KEY</div><div><div>Thoroughfare Type</div><div>Right of Way Width</div><div>Pavement Width</div><div>Transportation</div></div><div><div>ST-57-20-BL</div><div></div></div></div>	
<div><div>THOROUGHFARE TYPES</div><div><div>Highway:</div><div>Road:</div><div>Street:</div><div>Drive:</div><div>Avenue:</div><div>Commercial Street:</div><div>Boulevard:</div><div>Rear Alley:</div><div>Rear Lane:</div><div>Path:</div><div>Passage:</div><div>Pedestrian Mall</div></div><div><div>HW</div><div>RD</div><div>ST</div><div>DR</div><div>AV</div><div>CS</div><div>BV</div><div>RA</div><div>RL</div><div>PT</div><div>PS</div><div>PM</div></div></div> <div><div>TRANSITWAY TYPES</div><div><div>Rail Rapid Transit</div><div>Commuter/ Rail</div><div>Light Rail Shared</div><div>Light Rail Dedicated</div><div>Light Rail Segregated</div><div>Streetcar / Tram</div><div>Bus Rapid Transit</div><div>Bus Transit</div><div>Paratransit</div></div><div><div>RRT</div><div>CMR</div><div>LR</div><div>LRD</div><div>LRS</div><div>STC</div><div>BRT</div><div>BST</div><div>PRT</div></div></div> <div><div>BIKEWAY TYPES</div><div>See Bicycling Module</div></div>	
ASSEMBLY DESIGNATION	
Thoroughfare Type	
Right-of-Way Width	
Pavement Width	
Transect Zone Assignment	
PUBLIC FRONTAGE	
Drainage Type	
Curb Radius	
Walkway Type	
Planter Type	
Landscape Type	
Median Width	
VEHICULAR LANES	
Traffic Lane Width	
Parking Lane Width	
Target Speed	
Pedestrian Crossing Time	
TRANSITWAY TYPE	
Transitway Width	
Stop Placement	
Surface Type	
Surface Level	
BIKEWAY TYPE	

ST-69-42-LRD
Street
69 feet
42 feet
T3, T4, T5
Curb
5 - 10 feet
15 ft 11 feet
tree wells
trees at 30' o.c. avg
n/a
8 feet
8 feet
20 mph
4.6 seconds 5.1 seconds
Light Rail (Dedicated)
18 feet
existing and Dedicated Pavement
Dedicated
same as cars
See Bicycling Module

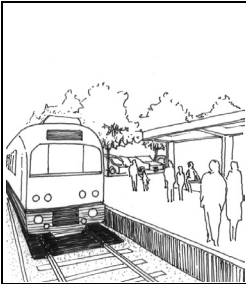
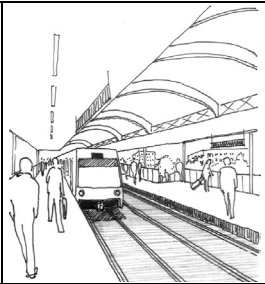
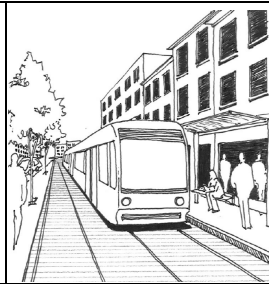
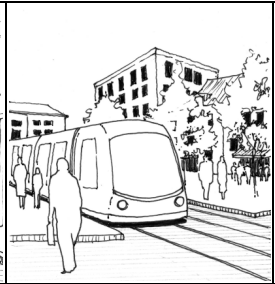
ARTICLE 7. DEFINITIONS OF TERMS
TRANSIT-ORIENTED DEVELOPMENT

These definitions differ from the Transit Modes and Applications descriptions found in the Appendix of this Module, in order to provide more calibration options. They may be reconciled or revised during local calibration, to match local, regional, or national usage. Standards such as measurements or assigned types should not be mixed with definitions, but should be added to the code text.

If the term does not appear in the calibrated code, it should not be included in the glossary.



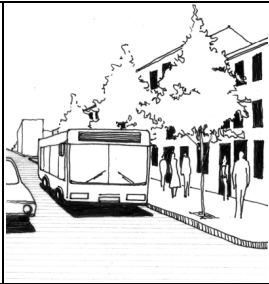
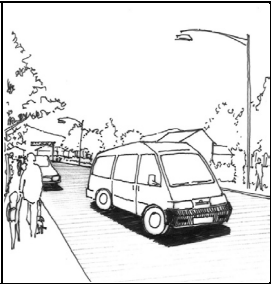
ARTICLE 7. DEFINITIONS OF TERMS
TRANSIT-ORIENTED DEVELOPMENT

- BRT:** see **Bus Rapid Transit**.
- Bus Rapid Transit (BRT):** a high speed bus system with dedicated lanes intended to provide many of the benefits of a light rail system without the cost.
- Bus Transit:** conventional bus system operating on shared travel lanes with frequent stops.
- Commuter Rail:** see **Regional Rail**.
- Dedicated:** reserved for a particular mode of transport.
- Light Rail:** an electric railway system characterized by its ability to operate single cars or short trains along exclusive rights of way at ground level, on aerial structures, in subways or in streets, and to board and discharge passengers at track or car-floor level.
- Paratransit:** an auxiliary transit service without fixed routes or schedules, typically using vans, small buses, or taxis.
- Regional Rail:** passenger trains operated on main line railroad track to carry riders to and from city and town centers, most frequently for work. The trains are normally made up of a locomotive and a number of passenger coaches. The coaches are dimensionally similar to intercity (Amtrak) coaches, but typically have higher density seating as the average ride is shorter.
- Streetcar:** a public vehicle operated on rails along a regular route, usually through the streets of a city. (Syn: tram, trolley car)

				
MODE DEFINITION	Regional Rail * Railway for urban passenger train service consisting of local short distance travel operating between a central city and adjacent suburbs and towns.	Rail Rapid Transit - RRT ** Typically consist of steel-wheeled, electric powered vehicles operating in trains of two or more cars on a fully grade-separated right-of-way.	Light Rail - LRT Local or metropolitan rail system operating mainly in dedicated ROW but sometimes, mixed with other traffic. The term <u>light</u> is intended for flexibility, light loads and fast movement rather than referring to physical weight. Ususally lower frequency and/or shorter trains than RRT systems.	Streetcar / Tram Urban rail system that runs mainly on city-center streets, providing a local service and picking up and discharging passengers at short-distanced stations. (Stops at every block)
OPERATING SPEED	70 to 100 mph (110 to 160km/h)	50 to 80 mph (80 to 120 Km/h)	20 - 60 mph (30 - 95 km/h)	8 - 12 mph (12 - 20 km/h)
APPLICATION & SETTING	Regional and Interurban service type connecting suburb to city center. Generally built on existing tracks at grade street crossings.	High density corridors. Mainly underground or elevated ways. (Exclusive Rights-of-way)	With an overhead power supply, light rail systems can operate in mixed traffic and widely ranging alignment configurations. Applications: urban to suburban	Alignment in street with traffic, no grade separation. Unlike LRT, streetcars City center, Urban circulators.
STATION SPACING	2 - 5 miles. Limited Stations, City center serving	Urban core 1/2 mile - 1 mile, Periphery 1 - 5 miles.	1/4 mile - 2/3 mile	Block to block (0.25 miles)
TYPICAL POWER SOURCE	Diesel, electric, dual mode	Electric	Electric, DMU (Diesel Multiple Unit)	Electric
EXAMPLES	SEPTA, Philadelphia. METRA, Chicago. Caltrain, SF Bay area. Regionalbahn in Berlin, Suburban Rail Services in London.	MARTA in Atlanta, BART in Bay Area, CTA Washington Metro. Paris METRO, London UNDERGROUND	Sacramento, Portland OR, Salt Lake City, Boston green line. Strasbourg (France), Zurich (Switzerland)	Portland Streetcar, F line San Francisco, Memphis. Helisnki (Finland), Prague and Plzen (Czech Republic)

* AKA Commuter Rail ** AKA Heavy Rail

DMU Diesel Multi Unit Consisting of multiple carriages powered by one or more on-board diesel engines.

				
MODE DEFINITION	Bus Rapid Transit A rubber tired system with its own right-of-way or dedicated lane at least 70% of its route, providing transit service that is faster than a regular bus. Featuring both articulated and single vehicles.	Electric Trolley Bus An electric, manually steered, rubber-tired system powered by two overhead supplier wires.	Bus Transit Rubber-tired vehicles in mixed traffic	Paratransit Small vans running in mixed traffic.
OPERATING SPEED	8 - 12 mph (12 - 20 km/h)	8 - 12 mph (12 - 20 km/h)	8 - 12 mph (12 - 20 km/h)	Covered by general traffic code.
APPLICATION & SETTING	Less dense environments, urban to suburban. May be a building block to rail. Applications: Regional, Urban.	Better performance than other modes on steep hills . Operate in mixed traffic and, have a good range of movility on both sides of the wires' edge. New systems are known as the most silent of all transit modes.	All settings. Connection to rail or BRT, local transportation.	Common application on suburban or rural environments and, for specialized transportation.
STATION SPACING	Limited stations, short to long.	0.10 to 0.35 miles	Urban core < 1/4 mile Periphery <1/2 mile	On-demand
TYPICAL POWER SOURCE	Diesel, Electric, Natural Gas	Electric (by overhead wires). Some vehicles can run on batteries for a short distance.	Diesel, Natural Gas	Natural Gas, Petrol
EXAMPLES	Brisbane, Pittsburgh, Silverline - Boston. Curitiba (Brasil), Bogota (Colombia), Cambridge (United Kingdom), Adelaide (Australia)	San Francisco USA, Philadelphia USA Vancouver (Canada), Salzburg (Austria), Milan (Italy).	Most cities	Most cities

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